THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXX. No. 1791.] LONDON, SEPTEMBER 7, 1897. [49TH YEAR. PRICE 6d.

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FOR
GAS, STEAM, WATER,
AND ALL PURPOSES,
ALSO
COILS OF EVERY SIZE AND SHAPE.

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WOLVERHAMPTON.
ESTABLISHED 1861.

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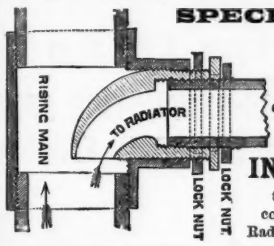

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'ACME' PATENT INJECTOR,
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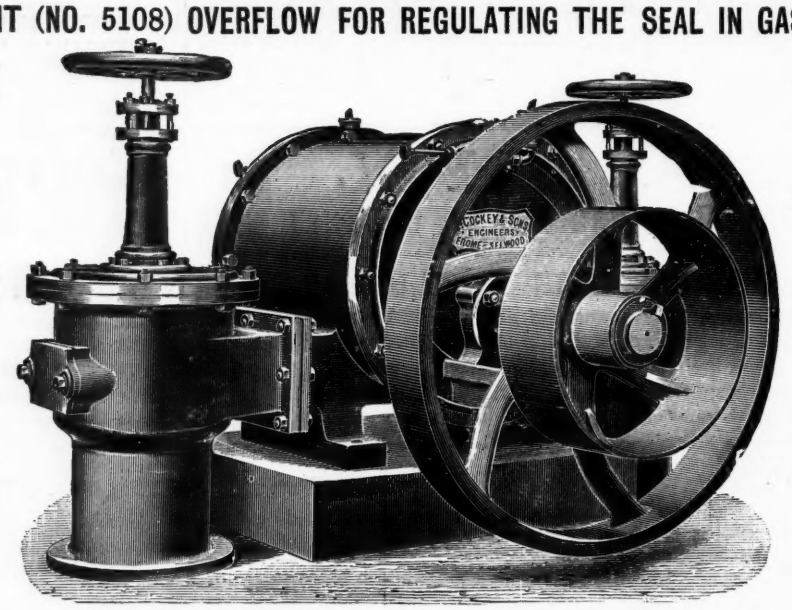

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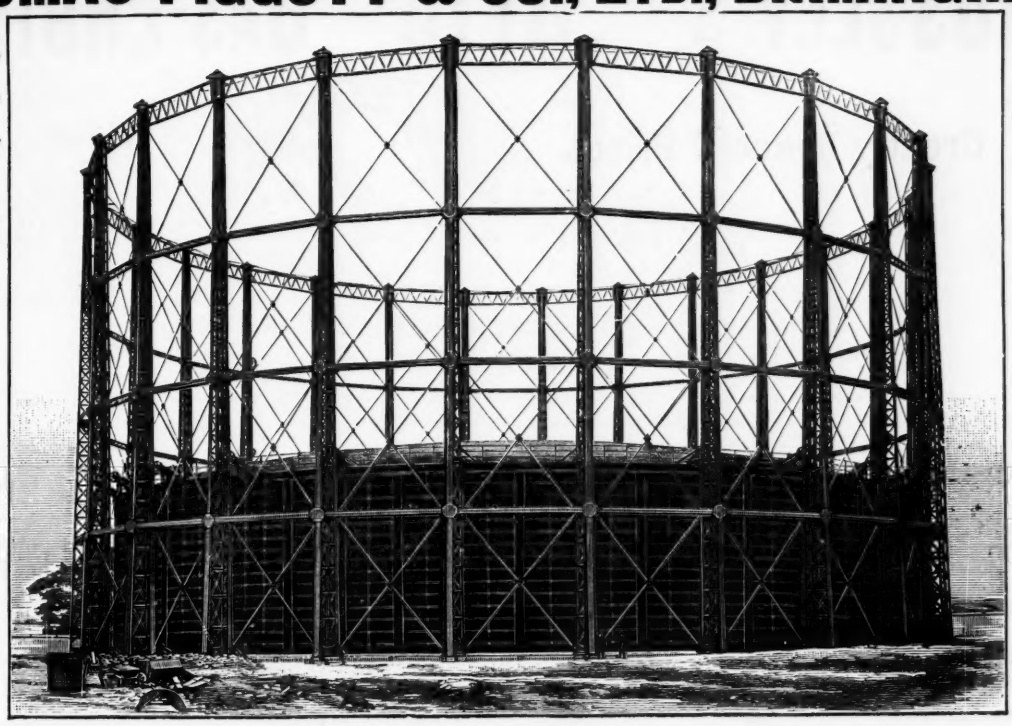

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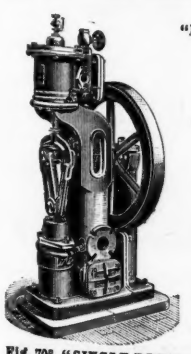

Fig. 703. "SINGLE RAM" STEAM-PUMP.

Fig. 593. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

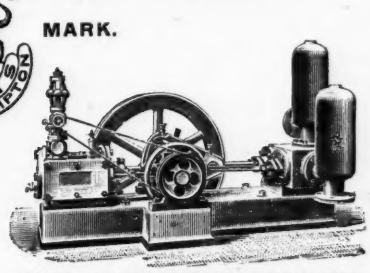

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

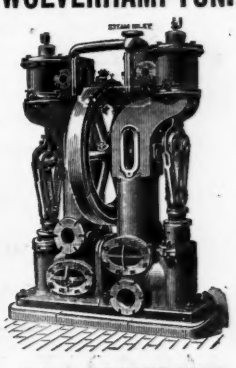

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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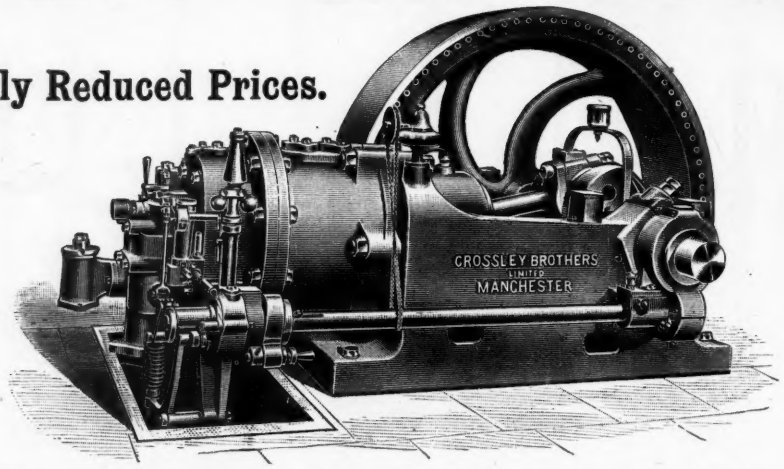

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SCREWS of all sizes.
GASHOLDERS,
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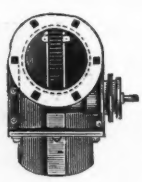
Gasholder Tanks.



CAST-IRON RETORTS,
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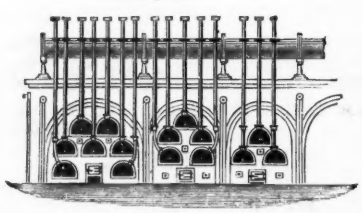

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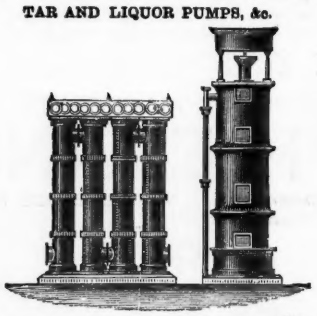

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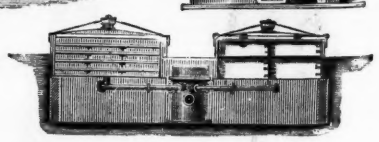

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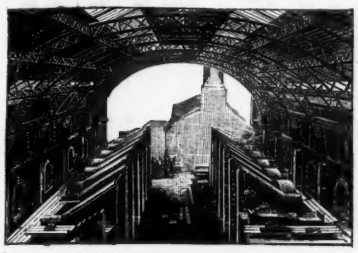

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All sizes,
From 50,000 to 5,000,000 Cubic Feet of Gas per day.
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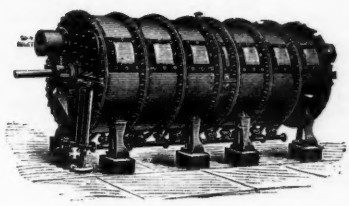

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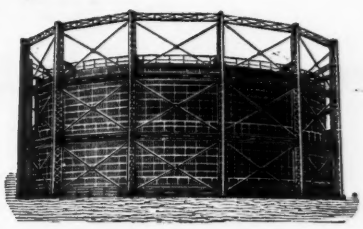

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FOR ENRICHING GAS IN BULK.

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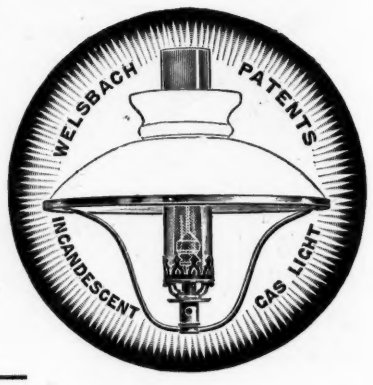

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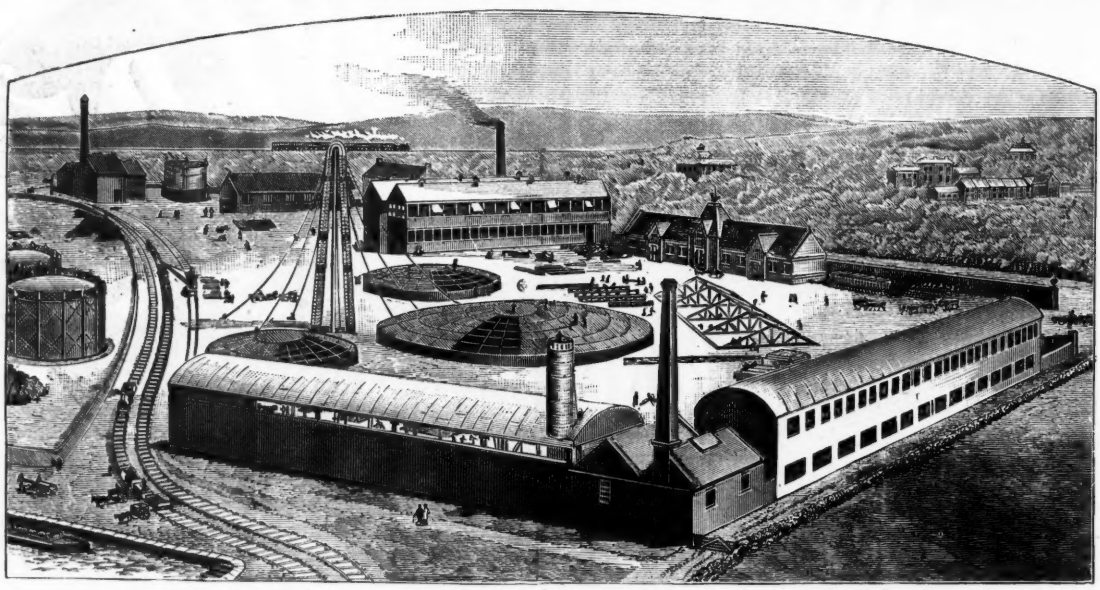

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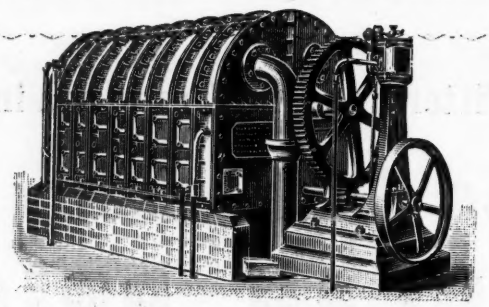

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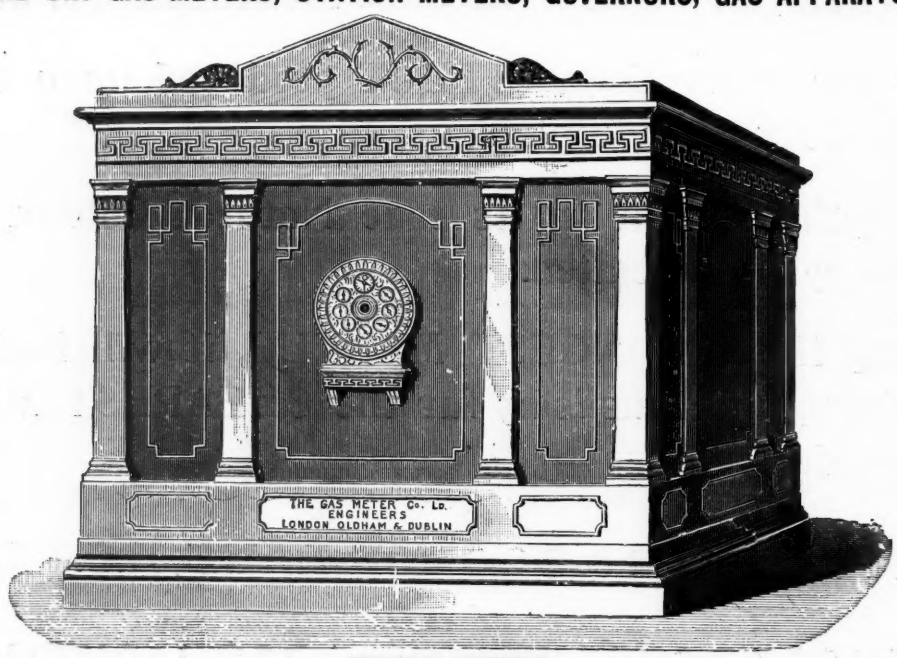
SQUARE STATION METERS WITH PLANED JOINTS.



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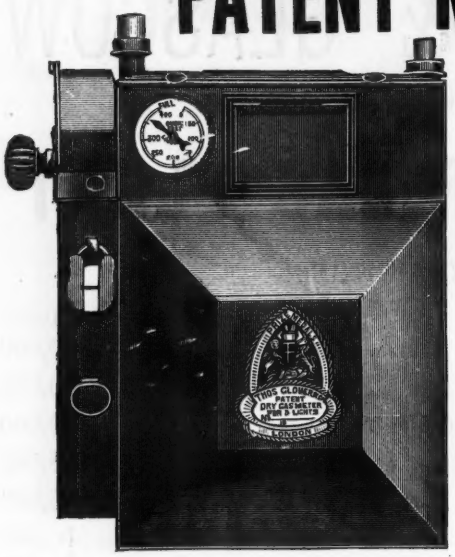

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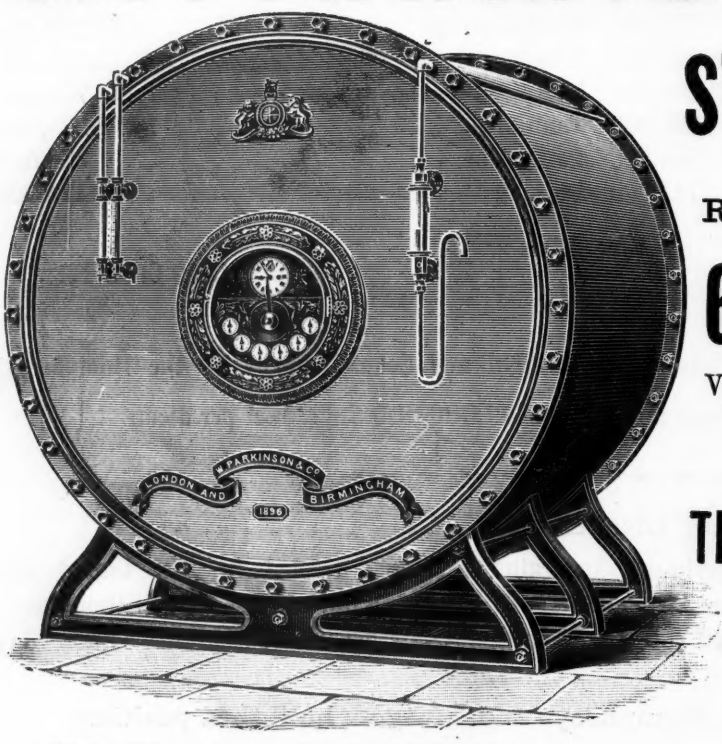

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[See also Advt. p. 560.

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EDITORIAL NOTES.

The Local Government Board on Carburetted Water Gas.

AT last something like an official statement respecting the Government view of the sanitary aspect of carburetted water gas has been made public. The Stockport Corporation recently needed a further gas loan of £36,000; and they communicated with the Local Government Board on the subject. There was some local opposition to the proposals of the Corporation—mainly on the score that the supply of carburetted water gas was intended, and this was objected to as dangerous. It hardly needs to be said that a good deal of criticism of one kind and another, from various sources, has been bestowed of late upon the gas policy of the Stockport Corporation. In the issue of the "JOURNAL" for Feb. 16 last, we noticed that some busybody had been taking advantage of the platform provided by the Stockport Trades Council for calling the Corporation to account in respect of their carburetted water-gas manufacture. Less than a month later—to be precise, on March 9—we chronicled the fact that the Local Government Board had refused a small loan to the Corporation for carburetted water-gas plant; and we suggested that the Corporation should go to Parliament for powers to proceed with this manufacture. It then appeared from the official letter to the Corporation, that the Department did not see how they could admit the proposal to send out a proportion of carburetted water gas with the ordinary town's gas, while they had no powers to prevent this admixture being carried to a dangerous extent. The subject cropped up in Parliament in the course of the following month; and all this time the Corporation were in the awkward position of having spent the money they wanted to borrow, and of actually supplying carburetted water gas. They could not help themselves. On May 4, a local inquiry was held by Mr. G. W. Willocks upon the proposal of the Corporation to borrow £36,039 for gas-works extensions, when the subject of the distribution of a proportion of carburetted water gas with the town's gas was raised by local Trade Unionists, who had got hold of the notion that this admixture was especially undesirable for Stockport, where a good deal of the gas is burnt for the gassing of yarns. After this, the Stockport Trades Council decided to send a protest to the Local Government Board against the action of the Town Council in manufacturing and distributing carburetted water gas. The Local Government Board demurred to the Corporation proposal; and to bring matters to a climax, the Corporation sent a deputation to interview Mr. Chaplin, with a promise that not more than 25 per cent. of carburetted water gas should be sent out.

The Department have now notified the Corporation that, inasmuch as the works covered by the new loan are urgently needed, and must be proceeded with irrespective of the question of carburetted water gas, the loan will be sanctioned upon this understanding. The Board declare, however, that they "are satisfied from the information "which they have received, that the supply of water gas "might be attended with serious results; and they have in "contemplation the appointment of a Departmental Com-"mittee to consider the whole question." Since some time must elapse before such a Committee would be in a position to report, and as Stockport cannot wait, the loans are sanctioned as aforesaid, "providing the Town "Council pass a resolution that they will not supply "water gas except when mixed with coal gas, and "that under no circumstances shall the proportion of "water gas in the mixture of coal gas exceed one-"fourth; and for the supply of water gas, even under these "conditions, the Town Council must accept the responsi-"bility." It is further observed that the Board have only stretched the point so far in order to meet the wishes of the Corporation, and because for the present they have no definite information as to the danger attending the use of water gas under the conditions prescribed. "It will, how-"ever, be understood that when the Committee which it is "proposed to appoint have made their report, the matter "will be subject to the reconsideration of the Board." This letter seems to indicate that the magnates of the Local Government Board have fallen somehow into a scare on the subject of carburetted water gas. It was,

therefore, rather unfeeling on the part of the Chairman of the Stockport Gas Committee to point out that carburetted water gas had been made in London for nine years past, and is "consumed in the offices of the Local Government "Board." This is true, of course. But if the statement reaches the ears of the typical country squire who presides over the Local Government Board, and whom an unkind fate has charged with the disposal of this chemical problem, will he have sufficient confidence in the innocuousness of London gas to attend his office and transact the business of the Department? What a funny combination of things it is that makes Mr. Chaplin the final arbiter, outside Parliament, of the fate of carburetted water gas in this country! Were it a matter of the breeding of shorthorns, now, or pedigree pigs—but carburetted water gas! Such is the working of our amazing Constitution. In the present case, we must wait and see how it answers.

The Strike in the Engineering Trade.

THERE is no change to report in the condition of the engineering trade. As usual, all the talking comes from the men's side; every day's newspaper having its announcement that Mr. John Burns, or Mr. Tom Mann, or some other stock performer, had addressed an enthusiastic meeting somewhere. All this, of course, will not have the slightest effect upon the issue; and it seems strange that such intelligent men as fitters usually are, cannot see how they are being fooled by their professional leaders. Mr. Burns now predicts that the men are bound to win "before many weeks are over." At the beginning of the strike, he was equally confident that the whole thing would be settled in a fortnight. Even he, however, admits the contingency of defeat, but pretends that this result would not greatly matter because "there would be an irresistible "demand at the next General Election for an eight-hour "day, which no party or Government would be able "to withstand." Surely, he must know that this is balderdash. Does he affect to think that all the voters of England will unite to demand that work in the London engineering trade shall be limited by law to eight hours a day? For others cannot forget—though he would appear to overlook the trifling detail—that the present eight-hour movement refers to London only. As we have all along remarked, the struggle would at least be intelligible from the men's side if it was for a universal 48-hour week. This point is thoroughly well grasped by the boilermakers, whose chief has been a thorn in the side of the autocrat of the A.S.E. all through. A ballot of the boilermakers was recently taken, to ascertain if the Executive have the support of the members in holding aloof from the London Committee, and resulted in a large majority for this policy. The members declared themselves in favour of a reduction of hours to 48 per week, and also for co-operation with other trades to obtain this concession; but they are not such fools as to seek this for their London members only. It is generally recognized that the present trouble will have to be carried through to a finish. There must be no mistake about the character of the finish, or all the loss due to the campaign will be thrown away. It has been seen in the Penrhyn case how the men and their Press partisans have misrepresented the character of the settlement. This is one of the stock tricks of the agitators' trade; but it has been played often enough. There is no real kindness in constructing a golden bridge for men like Burns and Mann to retreat from a lost position. It only enables them to claim a victory, and be ready to bang the drum again another day. Already there have been murmurs heard from the ranks of the A.S.E.; and a voice has declared that it would be to the best interests of the Society if the officials were to be put upon strike pay. There would not be many strikes if this were the practice of all Trade Unions. There is something essentially wrong in the existing system of management of these organizations, quite apart from the deeper question of their character. When the present outbreak is over, and the men go back to such work as they can get, let us hope they will indeed be wiser as well as sadder men, and will address themselves to the task of setting their Society house in order. It will be lucky for the older members if the reconstruction is not mournfully facilitated by the lack of any funds to liquidate the responsibilities of the old organization withal. It is difficult to make a trustworthy forecast of the immediate future. But we shall be prepared for a change of affairs by the end of the month, and fully expect the change, when it comes, to take the form of a sudden collapse of the forces of revolt. This would, of course, be accompanied by a loud protest that the Union only retreats in order to gather its forces for a greater effort next time.

Public Lighting by Incandescent Gas-Burners.

OUR readers are aware that the Superintendent of Street Lighting of Liverpool (Mr. C. R. Bellamy) has recently been investigating the subject of incandescent gas lighting for the public streets. His report setting forth the results of his labours has been presented to the Lighting Committee of the Corporation; and it appears *in extenso* elsewhere to-day. It was found that in Liverpool the bye-pass arrangement, with pilot light, was unsatisfactory; and so it was abolished, and lighting by the aid of a ladder was tried. The report shows this latter system to have been both costly and inconvenient; whereupon the attention of the officials was directed towards lighting the lamps by means of a torch and pole, in the ordinary manner. Some special mechanical adaptations of the casing of the lamp were, however, found necessary for this purpose; but these were soon provided. The system remains in use; and it is possible for Mr. Bellamy to give comparisons which are very instructive. They show that, in the brilliancy of illumination, the incandescent lamps are superior to those of the older type; that the consumption of gas is less; and that the total cost of street lighting is reduced. Mr. Bellamy's conclusion is that a general extension of the system seems irresistible.

The Danger of Gas Purifiers.

IN last week's "JOURNAL," there were published two articles upon the condition of the air of gas purifying houses, both of which contained some pointed remarks upon a subject that gas managers generally trouble themselves little about. It appears, however, that in Berlin some small agitation has been got up in regard to what was alleged to be the insalubriousness of the work of gas purifying; and an able German chemist has been at the pains of inquiring into the matter, with the laboriousness of his race. The result is what everybody with any experience in gas-works management would have expected. Traces of all sorts of noxious and malodorous gases were found in the atmosphere of the Berlin purifying houses; but nothing was present in quantity sufficient to hurt. It is notorious that a very small quantity of active material of some kinds will go a long way in affecting the human sense of smell. We never heard, however, that the ordinary smell of a gas-works was ever suspected of being injurious to health. The popular idea, in fact, has been quite otherwise; and the practice of exposing children suffering from whooping-cough to the fumes of a newly-opened purifier, has not yet died out either in England or France. Apparently this touching testimony to the health-giving powers of gas purifier waste is unheard of in Berlin. True, the tests in question have had reference only to the results of oxide purification; whereas it is "gas "lime" that is supposed to be so inimical to the germ, or microbe, or whatever it is, that constitutes the active principle of whooping cough. But it is difficult to believe that the mere change of base from lime to iron oxide would ever have sufficed to give gas purifying a bad name, if it had ever ranked as a popular remedy. Apart altogether from the question of poisonous gases in the atmosphere, however, we take this opportunity of once more enforcing the lesson of the great necessity that exists for the free circulation of air round gas purifiers. Recent history has demonstrated the fact that the purifiers, with their need for being opened and shut, are of all gas plant the most treacherous. Washers, scrubbers, station meters, are only shut off, opened, and entered occasionally; and there is usually enough strangeness in these operations to ensure their being carefully supervised and performed. With the purifiers, however, there is always the possibility of familiarity working its proverbial course; and the risk in this case is too great to be played with.

A Continental View of Sunday Labour.

ONE of those Congresses in which our modern labour politicians take such delight, has just been held at Zurich. It seems to have been a successful function of the kind; the attendance being large, and the proceedings rational and orderly. These international gatherings of labour agitators do not, of course, effect any positive or immediate

end; but sometimes they are interesting as indicating the way the wind blows in different industrial regions. The Zurich Congress was supposed to be convened in the cause of the protection of labour. This is a very wide term; and it transpired in the course of the proceedings that labour requires protection against many pernicious influences. The Congress not only discussed, but voted; and this was a sign of weakness, for nobody knew how far the assembly was really representative. One of the most interesting of the debates was on the question of Sunday work, in regard to which the "advanced" wing of the labour party in all countries is suspected of holding unorthodox opinions. There was a resolution before the Congress which indirectly raised the question of Sunday work; and the English delegates, who belonged to the Social Democratic Federation, distinguished themselves by denouncing the English, and more particularly the Scottish Sunday, in terms that somewhat astonished their Continental audience. It happened, however, that these English orators were a very small minority in the crowd of foreigners who had different ideas of Sunday observance; and eventually the Congress passed the following remarkable resolution, demanding "the prohibition on stringent penalties of Sunday labour "to be extended to all categories of wage-workers and "employees. Exception to this law shall only be per-"mitted for such labour as is absolutely necessary to "secure the resumption of work on Monday, or when, for "technical reasons, the process of production cannot be "interrupted." Exception was made also of all occupations concerned with the education and recreation of the people—a large exemption, designed to guard against the British Sunday, as described by the Englishmen. To meet the case of workpeople thus kept on duty during the popular holiday, it was resolved that all such workers should have every alternate Sunday off, and for every Sunday worked should have a complete day of rest during the week. This sweeping resolution was carried by an overwhelming majority against the British section, whose surprise at the defeat of their proposal to tamper with the principle of the Sunday rest was great. It must be conceded that their surprise was not unreasonable. Only a year or two ago, they saw a number of professedly representative French and German workpeople uniting to demand the abolition of the "superstition" of Sunday cessation from toil, on the ground that the "advanced" view of the conditions of modern industrial life did not warrant such an arbitrary interruption of productive labour. Now it was borne in upon them that "advanced" opinion had taken another turn. All this goes to show how chary one should be in listening to the newest and loudest cry of a handful of demagogues as constituting the "voice of the people." It is a lesson that some of our popular newspapers might, at the present day, usefully take to themselves.

The Autumn Meeting of the Institution of Gas Engineers.—The programme of arrangements for the Excursion Meeting of the Institution, to Amsterdam and Brussels, has now been issued. The party start next Tuesday evening by the Harwich route to the Hook of Holland, arriving at Amsterdam early the following day. A morning visit is to be paid to the Nieuwer Amstel works of the Imperial Continental Gas Association; and luncheon will be subsequently served. The afternoon is left at the disposal of the members for visiting the various places of interest in the city. By invitation of the Imperial Continental Gas Association, the members (and ladies, who are invited to the excursion) will dine at the Maison Couturier. On Thursday morning a visit is to be made to the Haarlemmerweg Gas-Works; and the rest of the day is to be occupied by a steamer excursion—the places to be visited depending upon the weather at the time. The party will leave on Friday morning for the Hague, and there inspect the Municipal Gas-Works; lunch at Scheveningen, as guests of the Dutch Gas Association; and afterwards go to places of note in the locality. The return journey to England can be made from here; but those able to prolong their stay away, will proceed to Brussels, and on the Saturday morning visit the Municipal Gas-Works, by invitation of the Chief Engineer, M. Aerts. The International Exhibition will also form a feature of this part of the trip. On Monday a move will be made to Antwerp; and at noon the party will be entertained at luncheon, at the Hotel St. Antoine, by the President, Mr. Corbet Woodall, M.Inst.C.E. After devoting the rest of the day to visiting the Cathedral, Musée Plantin, &c., the homeward-bound journey will be commenced by steamer from Antwerp to Harwich, arriving in England in the early hours of Tuesday, the 21st inst,

WATER AND SANITARY AFFAIRS.

THE public Press has not failed to observe that the first of September in the present year was not only the commencement of the partridge season, but was the date on which the Act to amend the law respecting the Metropolitan Water Companies was to come into operation. Perhaps the former event had the greater importance. The Act exists; but whether it is going to be called into a state of activity is essentially another question. The water consumer is told that he now has a tribunal to which he may carry his grievances, the Railway and Canal Commissioners having received authority for the purpose, their qualification for this duty consisting mainly in the circumstance that they have plenty of time on their hands. The "Daily Chronicle" goes so far as to think that the new Act may be better than nothing in the event of another water famine, but believes that in regard to "the daily "standing grievances from which consumers suffer" it will bring no sort of relief. Perhaps the "Chronicle" is losing faith in the grievances, and is preparing an excuse for their absence. The only hope of our contemporary is in a water famine; and this also may be absent. In that case the Act will be a dead letter, and the "Chronicle" may take credit for its prescience. "London" awakes to the fact, formerly so much lost sight of, that the measure is "only intended to be of a temporary character," pending the final settlement of the London water problem. But this weekly organ recognizes that there is at least one important feature in the Act, seeing that it enables local authorities to come to the financial aid of water consumers. The clause which gives this power is quoted *in extenso*. Now all that is wanted is one good grievance wherewith to haul the Companies, or at all events one of them, before the Railway Commissioners. We wait to see what is done.

The tactics of the London County Council relative to the Water Companies are being imitated by the Corporation of Portsmouth. The latter wish to acquire the water supply of the borough, and have approached the Directors of the local Water Company on the subject, by which procedure they have ascertained that purchase requires more than a million sterling. It has been proposed to raise a loan; and the Local Government Board have been asked to allow a period of eighty years for its repayment, in place of sixty. But the Department absolutely refuses to entertain the idea, a decision which leaves the London County Council without the shadow of a hope that its proposal for a period extending to a century would ever be sanctioned. If the ratepayers of Portsmouth are wise, they will let the water supply remain where it is; the redemption of capital being certain to add to their burdens. But the most striking similarity to the Spring Gardens policy is afforded by the conduct of the Portsmouth Corporation in turning round on the Company and quarrelling with their charges. The Company's revenue is to be curtailed in order that the undertaking may be bought up at a reduced price. Mr. H. H. Asquith, Q.C., and Mr. Cripps, Q.C., are upon the scene, contending that the Company are not justified in basing their charges upon anything more than the rateable value of the property.

If this is good law in Portsmouth, certain it is that the same conclusion follows in many places. But the basis of rateable value only exists in London in virtue of an Act passed a few years ago for that specific purpose. The Act was limited to the Metropolis, and had nothing to do with Portsmouth, or any other part of the country. Sir Edward Clarke, Q.C., is inclined to the view that the Water Company are authorized to charge upon the rent; but he is not quite sure on the point. The legal opinions are to be laid before the Town Council; and it is said the result is awaited with considerable interest, which we can readily believe, though we can only expect that the Local Authorities will accept the reading of the law which suits their present purpose. Respecting the terms of purchase, we observe that the paid-up capital of the Company was stated last year to be £315,000, and the loan capital £105,000. The dividends paid were 7 and 10 per cent., and the charge for water ranged from 1s. 6d. per 1000 gallons down to 8d. If there is to be any compensation for compulsory purchase, the amount demanded for the undertaking does not appear extravagant.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 543.)

Business on the Stock Exchange last week was very quiet indeed; and the prevailing tone was the reverse of cheerful. The bad weather had a depressing effect on rails, which the disastrous accident assisted to intensify. Then the fresh fall in the value of silver had its influence; while the advancing value of money took the cream off the prices of the gilt-edged class. Almost the only exception to the ruling depression was the American Market, which was buoyant on good dividend prospects of leading lines. The Money Market was full of expectation that the Bank of England would raise their rate on Thursday in response to the increased demand for gold; but the 2 per cent. rate was left standing. In the Gas Market, business was quite as quiet as in any of the rest; and as we are now at about the period of maximum inactivity, no revival can be looked for yet awhile. But there was no sign of weakness for lack of support; and everything remained very firm and steady. Changes of quotation are few in number, and very slight in degree; but they are all in the upward direction. In Gaslights, the "A" stock was moderately dealt in every day at remarkably steady figures —about 318; and the closing price was as good as any obtained in the week. The secured issues were hardly noticed until Saturday, when they were roused up; and a demand for the "H" 7 per cents sent the price up a point. South Metropolitan bid fair to be active at first, but soon relapsed into quietude, and showed no disposition to rise. Commercials made no sign. The Suburban and Provincial division was utterly stagnant; and no change in values was effected. Among the Continental Companies, Imperial alone exhibited anything like animation, maintaining its position well to the close. European was strong; and both issues advanced in price. None of the rest presented any feature. The new 4 per cent. debenture stock of the Buenos Ayres Company is now quoted. In Water, the few dealings recorded showed general steadiness; while New River had a marked rise.

The daily operations were: Business in Gas was rather quiet on the opening day. Prices were firm and unchanged. In Water, New River rose 5. On Tuesday, Gas transactions were extremely limited; and prices again closed steady, without variation. Wednesday was the counterpart of the previous day; and quotations still stood firm. In Water, Chelsea rose ½, changing hands at 340. Thursday was about the quietest day of the week. Transactions were very few; but both European issues advanced ¼. On Friday, there was a fair renewal of activity in Gas, and good prices were realized; but quotations did not move. Saturday's business was above the average; and Gaslight "H" advanced 1.

ELECTRIC LIGHTING MEMORANDA.

Municipal Progress and Electric Lighting—The Seamy Side—The Risk of Error—The Wise Course.

It is easy to understand why some of the electrical periodicals do not like the way of putting contemporary questions concerning electric lighting which characterizes this column. They have their own style of treating the same topics; and they usually meet with sympathetic notice by the newspaper press throughout the country, which generally participates in the vulgar error of regarding all movement as "progress." Whenever a small Municipality pass a resolution in favour of undertaking the supply of electric light, it is progress. When the suggestion bears fruit in the shape of a central station, inaugurated by some scientific big-wig, it is more progress. When the Electric Lighting Committee learn that the establishment has cost twice as much as they thought of spending at the outset, of course such progress must be paid for. And when, after a few years' working, the capital outlay is still on the increase, and the expected profit is still swamped in working expenses—well, progress is not to be had for nothing; and the ratepayers must comfort themselves with this reflection when they mark the twinkle of the electric light in the streets, and think of the unpaid demand notes at home. The other week we commented upon the way in which small local authorities are deluded into going in for electric lighting when a thoroughly independent survey of similar enterprises would convince anybody that there is not the smallest chance of a local venture of the kind becoming commercially successful.

Our observations upon this head have attracted unfavourable notice by more than one journal devoted to the interest ot the electric lighting industry. One of these organs describes them as "a fruitless endeavour to explain away the signs of progress of municipal lighting," which is applauded by another as making "legitimate fun" of our statements. Where the fun comes in, we have not succeeded in discovering, and whether our caution to local authorities will turn out to be fruitless or otherwise, is a matter that cannot be pronounced upon off-hand. Let us repeat once more that whosoever speaks in the interest of the gas industry, has no warrant for abusing electric lighting, because it never injured gas yet, and cannot do so in the future through being installed in a few more country places. When we endeavour to exhibit the seamy side of municipal electric lighting, by way of warning over-confident local authorities that such a side exists—intelligence that they are not likely to obtain from their electrical advisers—it is chiefly in the interest of the ratepayers, among whom is included the heavily-rated gas undertaking. We do say, and maintain, that local magnates infected by the "progress" microbe, are too often misled by the plausible arguments and estimates of touting electricians; and that many of the Municipalities who now find themselves in consequence burdened with a public electric lighting undertaking, have learnt that the reality of this kind of "progress" is anything but what their fancy painted it in advance. One of our contemporaries tries to shift the point by accusing us of conjuring up a bogey that does not exist, in the individuality of "a touting electrician, who canvasses Municipalities while in the pay of contractors, and while advising them as their consulting engineer." 'Tis a wicked world; and commercial travellers are not the only people who could describe themselves as addicted to "going to and fro, and walking up and down in it." It might not always be easy to establish an intimate connection between any particular errant consulting engineer and a firm of contractors; but as a matter of history, we never limited our criticism of the methods of the touting electrician by any such suggestion. All we said in this regard was that the "estimates are endorsed by a responsible construction company, who will engage to carry them out with efficiency and despatch." There is no suggestion of an illicit connection in this remark.

The fact of the matter is that local authorities contemplating making the plunge into electric lighting stand in danger of committing ruinous mistakes. It is not a question of fraud. They are liable, as plenty of examples show, to seriously under-estimate the capital cost of their experiment; and where the advice under which they are acting is that of a touting electrician, it is, humanly speaking, impossible for them to avoid this initial error. The touting electrician is a man who is trying to get a job out of the local authority. He is thus distinguished from the regular consultant, who is called in by the authority to advise them honestly and impartially. There is only one way by which an obscure local authority could depend upon getting impartial advice upon the question of the expediency of their undertaking electric lighting; and that is by going to a high authority, and paying him a fee for his counsel on the general question. It should be understood that there is no intention of employing the eminent gentleman to carry out a scheme. Some consultants could be trusted to do the right thing, even without the latter safeguard; but not all.

In many, perhaps the majority of cases, some sort of scheme has been produced by a speculative electrician, who has managed to get the ear of the local authority and the favour of one of the leading magnates. It should hardly need demonstrating that the authority itself is incapable of passing judgment upon any such project. It cannot say that the estimate of cost is sufficient for the purpose indicated, or for the locality; nor can it form an opinion as to whether the plan is likely to run into unprofitable extensions or not. The interest of the speculative electrician in committing the authority to a start, is so obvious and overpowering that it would be most improper to rely upon his word for these things. Yet this folly is sometimes perpetrated. Here, however, an idependent consultant is imperatively required, to assist those who will have to find the money. In the last resort, of course, the common sense of the authority itself must decide the question. But when ample precaution has been exercised in obtaining competent and sufficient expert advice, the average town or district councillor will be better able to discharge his duty to his constituents.

The Metropolitan Water Companies' Act, which, as our readers are aware, constitutes the Railway and Canal Commission a tribunal to which water consumers may appeal in the event of their having complaint to make in respect of the supply, came into operation last Wednesday. The text of the measure was given in the "Journal" for the 24th ult. (p. 445); and it will be seen therefrom that local authorities are empowered to assist consumers in the prosecution of their complaints, and they may be permitted to join them in any legal proceedings that may be taken.

Next Year's Examinations in Gas Manufacture.—The "Programme" of the Technological Examinations of the City and Guilds of London Institute for the session 1897-98 has been issued. Those of our readers who intend presenting themselves for examination next year will find in the book a great deal of useful information. The examinations will take place on Tuesday, May 3, from 7 till 10 o'clock. The Examiner is Mr. Alfred Colson, M.Inst.C.E., of Leicester; and the nature of the questions set in the Ordinary and the Honours grade may be gathered from the papers put before the candidates on the last occasion, which will be found in the "Journal" for May 11 (p. 1072). As inquiries are sometimes addressed to us in regard to instructors in gas manufacture, we may mention that a list of these is given on p. 200 of the book, which is published by Messrs. Whittaker and Co., of Paternoster Square, E.C., at the price of 10d. net.

THE ENRICHMENT OF COAL GAS.

THE bulk of the coal carbonized in many towns in the South of England, as is well known, is seaborne Durham coal; and men of eminence in the gas industry have advocated the general supply in these towns of the gas which it affords, without any addition of richer gas. Mr. George Livesey, in particular, has spoken strongly in favour of the supply to London of gas such as is produced without enrichment from Durham coal (see "JOURNAL," Vol. LXIII., p. 1048). At the official testing-stations, such gas would have an illuminating power of about 14½ candles; whereas London gas now averages nearly 16½ candles. The difference in the illuminating power of the proposed and the present gas is nearly two candles, or about 13 per cent. The candle-power here referred to is, of course, that determined by the consumption of the gas in the standard testing burner—an argand—under fixed conditions; and the difference would be greater were the gases tested in flat-flame burners.

No one would contend that the cost of two candles' enrichment at the present prices of enriching materials was disproportionate to the increased efficiency afforded, were nearly the whole of the gas consumed in flat-flame or even argand burners. But now a very large proportion of the gas distributed is consumed by methods whereon its photometric value is without influence. For heating, cooking, and motive-power purposes, and for lighting by incandescence, the duty performed by gas is dependent upon its calorific value. The calorific value, generally speaking, varies with the photometric value, but by no means to the same degree. London coal gas has a calorific value of about 625 British thermal units per cubic foot; unenriched gas from Durham coal, only about 575 units. The difference, which is certainly not under-estimated, is only about 8 per cent.; whereas the difference in the photometric values ascertained under standard conditions, is 13 per cent. Thus enrichment has not raised the calorific value to the same extent as the photometric value. Though, judged by the standard photometric test, enrichment by two candles may appear worth its cost to the consumer, it does not necessarily follow that it is not a loss to users of incandescent burners, motors, stoves, &c. Even if the calorific values given are not accepted as fairly true for the gases in question, the difference between results obtained by the same method of calorimetry will not be greater than that on which the argument is based. Indeed, according to M. Aguitton, the difference between the calorific values of 14½ and 16½ candle gas is considerably less than that here taken (see "JOURNAL," Vol. LXII., p. 402). When the candle-power of gases differs to a much greater extent than two candles, Dr. Bueb has found an even more marked want of concordance between calorific and photometric values (see "JOURNAL," Vol. LXV., p. 645). Increases of 56·4 and 85·7 per cent. in illuminating power were attended by increases of only 23·5 and 35·5 per cent. in calorific value.

Enrichment, therefore, appears only to give the consumer an enhanced value tallying with the expressed improvement in candle-power, so long as he uses the gas for lighting purposes in flat-flame or argand burners. But in almost all instances where great illumination is required, either incandescent or regenerative burners are now used; and the former kind is wholly, and the latter very largely, dependent for efficiency on the calorific power of the gas. In cases where flat-flame burners are still used, it is plausibly argued that a diminished lighting power would be of no moment. The increasing application of gas for stoves and motors favours the supply of the gas which affords the greatest heating value at the lowest cost. Such, in brief, is the argument against enrichment of coal gas in London and many other towns—viz., that, in the more important applications of gas, the added candle-power does not give an adequate improvement in efficiency when the cost of the enrichment is taken into account.

But, on the other hand, the additional cost of the enriched gas is confined to the manufacturing charges; and these for London gas amount to only about one-half the selling price of the gas. The cost of distribution would indeed be greater per thermal unit with unenriched than with enriched gas. Thus, even where gas was consumed solely for the sake of its calorific value, about 8 per cent. more 14½-candle gas than 16½-candle gas would be required to obtain the same effect; and, therefore, the distributing plant would need to have an increased capacity for the poorer gas, though not indeed to the extent indicated by the difference in the candle-power. A saving per candle or per thermal unit in the cost of gas in the holder, by the abolition of enrichment, is not therefore reflected without decrement on the cost to the consumer. The cost per candle of enrichment must be considerably greater than the cost per candle of the unenriched coal gas, before it will become economical from the consumer's standpoint to forego enrichment. For these reasons, therefore, the consideration of methods of enrichment is still of vital importance to gas engineers.

There have in recent years been many communications to technical Associations on the question of enriching coal gas; and they have been given in past volumes of the "JOURNAL." The literature on enrichment is now, however, very voluminous; and contradictory statements abound in it. The notes the publication of which is commenced in another column to-day, aim at giving a summary of the more reliable work of recent years. Somewhat similar was the aim of Mr. Thomas Holgate, Assoc.M.Inst.C.E., in a paper which was published in the "Minutes of Proceedings of the Institution of Civil Engineers," Vol. CXXVII., March, 1897, pp. 277-311. The lapse of time between the preparation of that paper and its publication has deprived it of rank among contemporary literature on the subject; and only the comparatively small number of gas engineers who are members of the Institution (and therefore entitled to a copy of the paper), will be able to appreciate it at its true worth. It seems a pity that Mr. Holgate did not, in the first instance, make his really meritorious summary accessible to all gas engineers through the medium of the columns of the "JOURNAL," with references to which his paper teems. In the article begun on p. 528, later information has, however, been used to supplement the results published by Mr. Holgate and earlier writers on the subject.

STRIKES AND PICKETING.

VERY opportunely, a little handbook entitled "The Case against Picketing" has been published by Mr. W. J. Shaxby through the Liberty Review Publishing Company, Limited. We call the issue opportune, because it is pretty obvious that the great strike and lock-out in the engineering trade is just entering in many places upon the secondary, or inflammatory stage, when heads are broken and the public peace disturbed. A London Magistrate the other day told a picket, who had been brought before him for molesting a man when going to his work, that he, the accused, knew perfectly well what was lawful picketing and what was not, and must therefore bear the consequence of transgressing the law. It is, of course, always presumed that every man knows the law; and the plea of ignorance is never accepted as excusing a transgressor. But though the presumption is necessary, and is, on the whole, justified by the fact that people rarely do illegal acts without knowing quite well what they are about, it would be difficult for most men to define in set terms what they understand to be the law.

Take, for example, this matter of picketing. The first thing done when there is a strike or lock-out is for representatives of the revolted workmen to post pickets at the entrance to the works. This is their first line of attack and defence; and so long as the pickets confine themselves to reconnoitring, and speaking to the men going in and out, with the object of informing them of the nature of the situation and persuading them to keep away from the premises, the law is not broken. It is worth while to give the words of the section of the Conspiracy and Protection of Property Act, 1875, relating to this subject. They run as follows: "Attending at or near the house or place where the person resides, or works, or carries on business, or happens to be, or the approach to such house or place, in order merely to obtain or communicate information, shall not be deemed a watching or besetting." Mr. Shaxby declares roundly that this is not what workmen on strike understand by picketing; and the very first words of his book define picketing as "coercive argument."

This, of course, is begging the question. We do not think there is anything to be gained by giving a thing a name of one's own devising, and then treating it as though the name had been accepted by everybody as the proper description of the thing. Picketing is too serious a subject to be disposed of in any such off-hand fashion. Unquestionably, employers do not like it, even in its legal shape; and workmen, while fully recognizing its value to them, are only too prone to carry it in practice beyond the bounds of legality. Let us understand clearly why there is such a thing as legal picketing. Its sanction does not depend upon the recited clause of the Act of 1875, but rests upon the broad ground of the common law. There is no offence in one man speaking quietly to another, or in watching him go about his lawful business. If an employer can legally ask a man to work for him, either personally or by a printed notice published in a newspaper or posted on a wall, it is open to workmen to take the same means for dissuading other workmen from doing so. Herein lies the difficulty of abolishing picketing by law. The term is merely a conventional one for denoting certain quite ordinary and lawful proceedings done in relation to a strike. If there is no strike, there can be no picketing; but striking is not in itself unlawful, and so it cannot taint as such its legitimate consequences.

The act of picketing is hedged about with many restrictions, and it is a performance that none but a cool-headed, experienced hand ought to undertake. Anyone who has witnessed (say) one of the numerous strikes in the building trades will have had the opportunity of seeing picketing carried on as one of the fine arts. A half-finished building is surrounded by a hoarding, in which there is a single door, guarded by the familiar legend "No admittance except on business." At a convenient distance—across the way or by a comfortable corner—stands a middle-aged man of mild aspect and somewhat deprecating manners. He is quite civil to everybody. Nobody can charge him with obstructing the public thoroughfare; and he never takes his eyes off that door in the hoarding. The man is doing no wrong; but in the degree to which the particular trade represented by him is "organized," he is as effectual for his purpose as "an army with banners."

Mr. Shaxby commits himself to another question-begging proposition concerning strikes. He admits that the act of striking cannot reasonably be made illegal, but he declares it to be "invariably foolish." This is far greater foolishness, because such an observation arouses doubt as to whether the writer is serious. Strikes, like lock-outs and wars in general, may be wrong nine times in ten; but they must be justified occasionally. Of course, if strikes are always foolish, picketing is never anything else but pernicious and ridiculous. Mr. Shaxby's idea is that the operation should be prevented by amendments of the law. In the first place, an amendment of the Conspiracy and Protection of Property Act, 1875, is suggested, giving power to the police to disperse a crowd of persons causing an obstruction "with the ostensible or avowed object of picketing." Probably this would be found unnecessary, as the police have already power to "move on" anybody stopping the circulation in a thoroughfare. Secondly, another amendment of the Act is suggested, embodying the recommendation of the Labour Commission to make section 7 read "uses or threatens to use violence to such other persons, or his wife or children, or injures his property;" omitting the ambiguous word "intimidate." Lastly, it is advised that offenders should be made amenable to summary process, instead of being left to be proceeded against by indictment. Mr. Shaxby is convinced that public opinion is ripe for such a strengthening of the law.

After all Mr. Shaxby's arguments, which are deprived of much weight by the obvious bias with which he writes, we come to the statement of the law of the matter, which is clear enough. No man, whether engaged in picketing or otherwise, has any right to molest or obstruct another in the pursuit of his lawful calling, upon peril of being sent to prison for three months, with or without hard labour. Molestation and obstruction are large terms, and include persistently following, hiding tools, watching and besetting, calling opprobrious names, and so forth. The decision as to what constitutes these offences rests with the Magistrates, who, as a rule, are to be depended upon for a knowledge of what is going on in their districts. They have a habit of fining the first one or two offenders, well knowing that the fine will be paid by the men's society. Afterwards, and in bad cases, the culprits are sent to gaol.

We part company with Mr. Shaxby where he declares that the anti-picketing legislation of the United States and certain Continental countries is in advance of that of the United Kingdom, and suggests that, "pending parliamentary action, the formation of a Free Labour Protection Association is desirable." The common law of this country is the best defence of free labour; and we are unable to greet with any enthusiasm the fashionable craze for the formation of class organizations. We should rather welcome the revival of that spirit of sturdy individual independence which made John Hampden strike in his own proper person against what he knew to be an illegal impost. There are far too many mutual societies in our community for doing what responsible people ought to be willing and ready to do for themselves; and these organizations are the hotbeds of an official class of secretaries and executive officials every bit as objectionable as the much-abused professional agitators who manipulate the Trade Unions in their own interest. There is no more melancholy indication of the decay of public virtue in a community than the hiring of officials to carry on "movements" and advance "views" with which it should be the part of responsible citizens to identify themselves, if the matter is worth anything. If Magna Charta were still to seek for England, in all likelihood the endeavour would be confided to a secretary, with offices and a staff for collecting subscriptions—and the job would be carefully nursed.

There is a good deal too much officialism about these proposals for protecting men who in other respects are credited with being quite able to take care of themselves. We are assured with one breath that certain people are competent to make their own bargains, and enter upon equal terms with their employers into contracts of vital importance to both parties. With the next breath it is declared that these same free and independent citizens are in need of protection against a Trade Union picket—with the policeman looking on. There must be a certain amount of hardihood in the composition of any man who sets himself against the general opinion of his equals; and the man who decides to go on working while his fellows are on strike must expect to experience a more or less unpleasant time after the law has done all it can for him. If he cannot put up with this penalty for his own independence, a regular Protection Society with an office and officials would only be thrown away upon him.

Workman's Compensation Act, 1897.—A useful commentary on this Act, giving the full text of the clauses and copious notes thereon, has been prepared by Mr. W. A. Willis, and is issued by Messrs. Butterworth and Co.

North of England Gas Managers' Association.—We learn from the Hon. Secretary of the Association (Mr. J. H. Penney) that the 41st half-yearly meeting will be held at Scarborough on Saturday, the 2nd prox., when the President, Mr. J. Holliday, Assoc.M.Inst.C.E., F.C.S., the Engineer and Secretary of the Scarborough Gas Company, will deliver his address, and Mr. Matthew Dunn, Engineer and Manager of the Gas Department of the Selby District Council, will read a paper entitled "Automatic Regulation of the Speed of Exhausters."

PERSONAL.

Mr. HUGHES, of Uppingham, has succeeded Mr. G. Robinson, who has gone to Brecon, as Manager of the Castle Donington Gas-Works.

Mr. G. MEAD ROBINS, a grandson of the late Mr. C. R. Mead, the Chairman of the Sutton Gas Company, has been appointed Secretary and Manager of the Company, in the place of the late Mr. Frank Mead. Mr. G. M. Robins was for thirteen years connected with the Bournemouth Gas-Works.

OBITUARY.

The death is announced, from Johannesburg, of Mr. WILLIAM HAMILTON BLAKENEY, at the age of 32. Mr. Blakeney, who was a native of Dundee, was the author of the scheme under which a supply of water was obtained for Johannesburg; his plans receiving the support of the late Mr. Barney Barnato, and through him of the governing authorities. Mr. Blakeney was on a visit to Mozambique, in connection with another water scheme, when he contracted typhoid fever, to which he succumbed.

The death is announced of Herr MORITZ RITTER VON PICHLER, Editor of our Austrian contemporary "Der Gastechniker." He died on the 20th ult., at Velden, after a tedious illness. He was 50 years of age, and had edited the above paper since October, 1890. He was the author of a well-known paper on "Indicator Diagrams." His loss will be keenly felt by the Association of Gas and Water Engineers of Austria-Hungary, with whose work he was intimately identified for some years.

Petroleum in Japan.—Petroleum well sinking is making progress in Japan. In 1893, the latest date for which there are any figures, there were 199 petroleum sections leased, with a total output of 3,320,707 gallons; whereas in 1889 the total yield was not more than 2,218,679 gallons. The majority of the wells are not more than 600 feet deep.

The Gas Tramway in Holland.—An attempt is being made to introduce the gas tramway in Holland. By permission of the management of the Imperial Continental Gas-Works at Amsterdam, rails have been laid down there; and anyone interested in street traction is invited to inspect a well-fitted gas-tramcar, designed to carry 40 persons, and to travel at a speed of about 10 miles an hour. According to "Het Gas," the trial car is likely shortly to be used on the street metals, in order that the general public may judge of its merits.

A New Form of Photometer.—At the recent meeting of the British Association, Professor Silvanus P. Thompson described a new form of photometer. A plane surface is pivoted on a vertical axis in its own plane, dividing it into equal parts. These are illuminated by the two sources of light under comparison, placed so that their directions seen from the axis of the plane surface are horizontal and at right angles. Then the illuminations of the two halves of the surface are proportional to the intensities of the two sources, to the sides of the angles between the plane surface and the directions of the sources, and inversely proportional to the squares of the distances. By rotating the plane surface until the two halves appear equally bright, a comparison between the intensities of the sources is made. In practice, the two sources to be compared, placed against two adjacent walls of a room, illuminate the two halves of a board covered with white blotting-paper inside a box fixed in the corner of the room. The board can be rotated about a vertical axis by a handle placed outside the box, and is viewed through an eyehole. When the board is turned into such a position that the two halves appear equally illuminated, the ratio of the intensities of the sources is the tangent of the angle between the board and one of the walls of the rooms, multiplied by the inverse ratio of the squares of the distances. The method is stated to be very convenient.

An Early Gas-Furnace.—The first successful apparatus of which we have any knowledge that burned fuel without the production of smoke was, says the "Engineer," invented by Abu Musa Dschabir Ben Haiyan—better known by the name of Geber—an Arabian alchemist, who lived about the end of the eighth century. Geber called his furnace the Tower of Athanor; and from its construction a steady and uniform heat could be maintained for an indefinite period. Its principal feature, according to Mr. W. F. Durfee, in the "Journal" of the Franklin Institute, was a high cylindrical tower for containing the fuel. This tower was flanked by two combustion chambers, in or over which the substance or vessel to be heated was placed. These chambers were connected with the central tower near its base by flues, in which were dampers for regulating the flow of the gas generated from the fuel. This furnace of Geber was really a "gas-furnace;" and the general principles involved in its construction were the same as are seen in everyday use in all self-feeding, base-burning stoves, and in many gas-furnaces for metallurgical purposes. Many of the so-called improved gas-producers are no better than, and but slightly different from, that invented by Geber more than a thousand years ago; and he must be regarded as the discoverer of the great advantages resulting from converting solid fuel into a combustible gas, and then burning the gas in a combustion chamber separate from that containing the solid fuel.

NOTES.

French Practice with Large Gas-Engines.

Particulars have been published in "Engineering" of the progress of the development of gas-engine power in the neighbourhood of Rouen, where the use of gas-engines of large size has for some years been a feature of the local factories. Messrs. Matter and Co., of Rouen, are the specialists in this branch of mechanical engineering. Coal gas being dear in France, it has been necessary to adapt the gas-engine to use so-called "poor gas" made in generators. At first Dowson gas-producers were used; but these had the drawback of requiring an accessory steam-boiler; and consequently recourse was had to the Buire-Lencauchez system of gas production, into which steam does not enter. The Buire-Lencauchez producer is an iron cylinder lined with fire-brick, and fitted with inclined fire-bars kept wet from a hollow bar at the top. This water makes all the steam used either in passing along the bars or by evaporation from the wet ashpit; combustion being promoted by a small fan driven by the main engine. The result of the working of this producer is a gas of constant composition, of which about 88·3 cubic feet are required per brake horse power of the "Simplex" engine. The largest gas-engine power plant hitherto erected by Messrs. Matter and Co. is at the corn mills of the Société Truffaut in Paris. Here motors aggregating 530-horse power are at work; the two largest being of 250-horse power each, running day and night. Three gas-generators are required, gasifying Anzin coal, at the rate of only a small fraction over 1 lb. per brake horse power per hour.

Carbide of Calcium and Acetylene.

An account of the history, status, and possibilities of acetylene, by Mr. Henry Harrison Suplee, appears in the August number of the "Engineering Magazine." Though written from the American standpoint, the article contains much valuable information compiled from European sources. The author states that in 1839 Professor Torrey first noticed, in copper pipes used in New York for conveying illuminating gas, the presence of a brownish deposit, which proved to be an acetylide of copper, and was violently explosive by shock or a slight elevation of temperature. This revealed the presence of the gaseous acetylene in small proportions in the illuminating gas; the quantity varying from 0·06 to 1 per cent. Similar observations were made in Europe by Crova and Böttger; the latter preparing the acetylide of copper by passing illuminating gas through a solution of protochloride of copper. The patent of Mr. T. L. Willson, of New York, for the commercial production of calcium carbide by heating a mixture of lime and carbon in the electric furnace, is dated August, 1894. Subsequent modifications have been almost entirely in the details of the furnace and methods of handling; and at the present time carbide is being manufactured commercially at Niagara, at Froges in France, and at Neuhausen in Switzerland. With regard to the production of acetylene from calcium carbide, the writer urges that the method insisted on by Pictet is the only safe one—that is, the carbide should be plunged entirely beneath the surface of a comparatively large volume of water. This prevents any undue rise of temperature; and the water, moreover, is useful for washing the gas, which if afterwards desiccated is less liable to attack metal fittings. Against such acetylene the author thinks there is no reasonable objection to be taken, so long as it is kept at ordinary pressures. Beyond two atmospheres it becomes explosive. A method of storing acetylene in small bulk with comparative safety has been introduced by MM. Claude and Hess. This depends on the facility with which acetylene dissolves in acetone; the liquid absorbing at atmospheric pressure 31 times its own bulk of the gas. This process is declared to be safe up to a pressure of 150 lbs. per square inch, beyond which the fluid begins to partake of the qualities of liquid acetylene. On the whole, and without undertaking to settle the question of the cost at which it should be possible to produce carbide of calcium, Mr. Suplee concludes that acetylene as an illuminant has a positive value which for many purposes is immediately available; that it can be produced and employed without greater risk or danger than is involved in the use of ordinary illuminating gas; that, in the compressed or liquefied form it should be handled only by experts under well-ascertained conditions; but that notable advances must be made in its economical production, if it is to compete broadly with coal and water gas as an illuminant.

The Study of the Scrap Heap.

A good illustration of the spirit which goes to the making of an expert technician is afforded by the concluding paragraph of a paper on steel rails contributed to the "Engineering Magazine" by Mr. H. G. Prout. His remarks upon this subject are equally applicable to other matters of professional interest. He said he thoroughly believed that the principles he had laid down in his paper were sound, and that if he were in charge of a great railroad he should unhesitatingly stake his reputation upon them. Yet he might contradict some of them within a year; for there are few things concerning which human knowledge can ever be absolute, and this particular subject is not among them. In this matter, it is well to remember that the secret of success is to try, to fail, and to analyze failure. Mr. Whittemore has expressed the same idea in more homely words in an apostrophe addressed to the scrap heap. He says: "The scrap heap, the inarticulate witness of our blunders and the sepulchre of our blasted hopes, the best but the most humiliating legacy we are forced to leave to our successors, has always been to me brim full of instruction." If the young engineer, says Mr. Prout, will "candidly and courageously, modestly and without pedantry, study the scrap heap, I think I can predict for him a reasonable measure of success."

The Use of X-Ray Tests in Engineering Work.

It is stated by Mr. Louis Bell, in an American contemporary, that some use has been found for Röntgen ray tests in metal-working establishments. It is not suggested that an X-ray outfit is necessary in every shop; but the process has its uses. An example is named where a firm had to ship a large number of pieces of small apparatus in cases, when it was discovered that in some of them the interior connections had slipped out of place. To take apart the cases, inspect the interior, and assemble the parts again would have been a costly and time-consuming operation. Consequently an X-ray test was undertaken, by the aid of which the defective sets were put aside for repair. More recently, as X-ray apparatus has been brought into greater practical shape, it has been suggested for use in inspecting metal scantlings for faults and blowholes. Sheets and bars of steel and iron up to an inch or upwards in thickness can be examined successfully by the fluoroscope. Whether the inspection is conducted by photography or the eye, the flawed material is detected by an increased translucency of the metal at the affected spots. From our present standpoint, the method seems to possess rather limited applicability. But it certainly gets at the facts in the case; and improvements in apparatus, concerning which our knowledge is very small considering the vast amount of research expended, may at any time raise it to the rank of a method of general utility.

Belgian Coke Exports.—Belgium exported 473,952 tons of coke in the first half of this year; the amount in the corresponding period of 1896 being 413,988 tons. In these totals, the exports to France figured for 298,996 tons and 246,750 tons respectively.

Indexing Technical Literature.—The Committee on Indexing Chemical Literature presented their fifteenth annual report to the American Association for the Advancement of Science at the recent meeting. It appears therefrom that a biography of the metals of the platinum group, 1748-1896, by Professor James Lewis Howe, and a review and bibliography of metallic carbides, by Mr. J. A. Mathews, have been completed, and have been recommended to the Smithsonian Institution for publication. Progress is being made with an index to the literature of thorium and a bibliography of oxygen.

Visit of Municipal Engineers to the Elan Valley.—A party comprising nearly a hundred members of the Association of Municipal and County Engineers have visited the works in progress in the Elan Valley, in connection with the Welsh water scheme of the Birmingham Corporation. The visit was made on the invitation of Mr. J. Mansergh, M.Inst.C.E., the Engineer of the scheme, who personally conducted the party over the works, and explained the principal points of engineering interest. The President of the Association (Sir A. R. Binnie, M.Inst.C.E., the Chief Engineer of the London County Council) accompanied the members, who were received at the Rhayader section of the aqueduct, and walked through a completed portion of nearly half a mile in length. Messrs. John Aird and Sons, who are carrying out this section of the work, entertained the members to light refreshments, which were provided in the aqueduct. An open-truck train was then boarded, and a journey made along the full length of the railway which has been constructed on the higher slopes of the valley. On the conclusion of the inspection, Mr. Mansergh entertained the members to dinner in the large hall of the recreation room; Lady Binnie, Miss Mansergh, and several other ladies who had joined in the visit, being present.

The Late Mr. C. R. Mead and the Bournemouth Gas and Water Company.—In the notice of the late Mr. C. R. Mead, of Sutton, which appeared in the "JOURNAL" last week, reference was made to his early association with the Bournemouth Gas and Water Company, of which he was Chairman at the time of his death. A correspondent questions whether this connection commenced as far back as 1840, inasmuch as Bournemouth was only a fishing village with 800 inhabitants in 1851. At all events, the undertaking was in a very bad way when Mr. Mead took the reins. Not only were there no dividends, but the works did not pay their way. It seems that in December, 1861, application was made to the Town and County of Poole Gas Company for a supply of gas to Bournemouth. In 1865, the Company lent the Bournemouth Company 50 tons of coal; and there was similar accommodation to the extent of 20 to 30 tons in 1868. This does not seem like good management. But look at the Company now. According to the last parliamentary returns, they carbonized 24,640 tons of coal in 1895, and made 249,908,000 cubic feet of gas, of which 210,243,200 cubic feet were sold for private consumption, and 13,943,200 cubic feet for public lighting. Bournemouth has prospered, and the Gas and Water Company with it.

TECHNICAL RECORD.

NOTES ON THE ENRICHMENT OF COAL GAS.*

A profitable study of enrichment must begin with a thorough acquaintance with the gas which is to be enriched. The only case which it is proposed shall be dealt with here is the enrichment by a few candles of the gas from ordinary bituminous coal. The approximate composition of such gas is well known to all gas engineers; but even experts have not a clear conception of the precise nature and amount of its "illuminant" hydrocarbons. Their separation and analysis are beset with difficulties. Moreover, comparatively few reliable analyses of such unenriched coal gas have been published; though analyses of coal gas enriched with a small proportion of cannel gas are plentiful. The following shows the average composition—deduced from five reliable analyses—of purified gas made at heats now generally prevalent in retort-houses, from ordinary gas coal, without admixture of enriching material:—

	Per Cent. by Volume.
Hydrogen	52·87
Methane	35·83
Carbonic oxide	4·44
Hydrocarbons	3·37
Nitrogen	3·07
Oxygen	0·37
Carbonic acid	0·05

The volume given for methane includes a small quantity of other hydrocarbons of the paraffin series. The figure given for hydrocarbons is made up of about 0·9 per cent. of benzene and its homologues, and 2·47 per cent. of ethylene and other olefines. It is customary to classify the constituents of coal gas according to their behaviour in, and effect upon, the flame of the gas. Nitrogen, carbonic acid, and oxygen are undesirable constituents, and injure the illuminating effect of the flame. The extent of the injury caused by definite proportions of these gases will be briefly considered later. Hydrogen and carbonic oxide are spoken of as diluents because they do not in themselves afford a luminous flame; but the heat of their combustion plays an important part in developing the luminosity of the illuminating gases. The latter are strictly only the "hydrocarbons"—a term which is generally understood in analyses of illuminating gas not to include methane and its homologues. Methane plays a dual part. It is primarily a diluent; but, as will appear later, it is also *per se* a feeble illuminant. The action of the diluents and the cause of the luminosity of gas-flames are very interesting points, on which much has been written; but it is unnecessary to discuss them here, as only one case of enrichment will be considered—viz., that of coal gas. The action of the diluents will, therefore, be constant, and need not be debated in considering the practical use of enriching agents. The illuminating constituents must, however, be more closely considered, as enrichment is effected by increasing their amount or by the addition of other illuminating gases.

Methane is only a feeble illuminant; and burnt alone in the standard argand testing-burner it does not give so great a luminosity as coal gas. Mr. Lewis T. Wright found that it had an illuminating power equivalent to 5·2 candles.† Therefore an increase in the proportion of methane in coal gas will not directly increase its illuminating power; and methane as a practical enricher must be put aside. Of the homologues of methane, ethane and propane are both gaseous at ordinary temperatures, and occur in trifling quantities in coal gas. Consumed in an argand burner, they were found by Dr. Percy F. Frankland to have illuminating powers equivalent to 34·8 and 53·9 candles respectively, under standard conditions of testing. Evidently, therefore, an increased proportion of either of these hydrocarbons would improve the illuminating power of coal gas; and since they are gaseous, they are unexceptional enriching agents. Normal butane is a liquid boiling at 34° Fahr.; and it is, therefore, gaseous under all ordinary conditions. Its illuminating power does not seem to have been ascertained. Isobutane is gaseous at ordinary temperatures. It is doubtful if the butanes occur at all in coal gas; but they are found in some enriching gases. Of the pentanes, the normal has the highest boiling point—97·3° Fahr.—and is the chief constituent of gasoline prepared from American petroleum, and of the pentane used in Mr. Harcourt's standards of light. Its vapour tension at 32° Fahr. is 183·4 mm.‡ Therefore, the vapour of normal pentane can mix with air or gas until it forms a maximum of 24·1 per cent. of the total volume at 32° Fahr. Isopentane boils at 82·3° Fahr., and is associated with the normal hydrocarbon in petroleum, &c. It has a higher vapour tension than normal pentane; and, therefore, gas saturated with it contains a greater volume of the vapour. Some experiments by Dr. H. Bunte,§ indicate that 1 per cent. of pentane vapour increases the illuminating power of coal gas about 1·6 candles. Pentane is not known to occur in coal gas. But all the three isomeric pentanes have so high vapour tensions that no objection can be raised to their employment as enriching vapours; and they are found in many enriching gases. Normal hexane boils at about 156° Fahr.; and is the chief constituent of the carburine prepared from American petroleum. Some of its isomers are associated with it; and a mixture of hexanes boiling between 145° and 155° Fahr. is often spoken of as hexane. Its behaviour under the influence of heat has formed the subject of an instructive series of researches by Dr. F. Haber.* Clearly, it has not a simple vapour tension owing to its complex composition; but about 6 per cent. of hexane vapour saturates gas at 32° Fahr. It appears from Dr. Bunte's researches that 1 per cent. of hexane vapour increases the illuminating power of coal gas by about 2·5 candles. Hexane is not found in coal gas, but occurs in many enriching agents. Its vapour tension is sufficiently high to betoken its suitability for enriching coal gas by a few candles only. Mixed heptanes occur in petroleum spirit from American petroleum. Normal heptane boils at about 208° Fahr. The vapour tensions of the heptanes do not appear to have been accurately determined; but with gas at 32° Fahr. the saturation point is quickly reached. An addition of 1 per cent. of heptane vapour increases the illuminating power of coal gas by about 3·5 candles. Heptane vapour occurs in several enriching gases; but its low vapour tension renders it comparatively useless for enriching by more than (say) 1 candle coal gas that is liable to be exposed to low temperatures. The octanes and higher paraffins have too low vapour tensions to form reliable components of enriching gases; and they are not present in coal gas.

Ethylene is the lowest member of the olefine series of hydrocarbons, and is an important illuminant in coal gas. Together with traces of other olefines, it forms nearly 2·5 per cent. of ordinary coal gas. It is gaseous at all ordinary temperatures; and according to Dr. Percy F. Frankland it can be burnt alone in an argand burner so that it gives an illuminating power equivalent to 68·5 candles under standard conditions of testing.† Ethylene raises the candle-power of disilluminated coal gas to the following extent:—

Percentage of Ethylene by Volume.	Candle Power of Gas Produced.	Candles per 1 per Cent. of Ethylene.	Authority.
6·99	12·41	1·77	Dr. H. Bunte ("JOURNAL," Vol. LXII., p. 720).
13·41	16·84	1·26	Dr. P. F. Frankland ("Journ. Soc. Chem. Ind." Vol. III. p. 271).
23·65	25·64	1·08	Dr. H. Bunte ("JOURNAL," Vol. LXII., p. 720).

The higher duty apparently yielded by ethylene at the lower candle-powers is doubtless largely due to the illuminating value of the methane which remains in coal gas disilluminated by bromine or fuming sulphuric acid. In coal gas itself, and in the enrichment of coal gas by a few candles only, 1 per cent. of ethylene may be considered to impart about 1¼ candles of the total illuminating power. Ethylene may be added to any extent to coal gas, since it is gaseous at all ordinary temperatures. It is, therefore, a reliable enriching gas; and since it has a fairly high duty as an illuminant, it is a valuable component of enriching mixtures.

The next olefine is propylene, which is gaseous at all ordinary temperatures, and is found to a small extent in coal gas. Its value as an illuminating gas does not appear to have been determined. Butylene is likewise gaseous. According to the late Professor W. Foster, it develops in an argand burner an illuminating power of 123 candles. It may be safely assumed that, volume for volume, propylene and butylene raise the candle-power of coal gas to a greater degree than ethylene. Of the five known amylenes, the normal boils at 102° Fahr. They have very high vapour tensions; and a test by Dr. Bunte appears to show that coal gas at 12° Fahr. can retain 13·7 per cent. of their vapour.‡ So-called amylene was found by the same chemist to raise disilluminated coal gas to 20·7 candles at an average of 4·0 candles for every 1 per cent. of the vapour present.§ Normal hexylene boils at about 154° Fahr. Neither the hexylenes nor higher olefines appear to have been studied in respect of their value as illuminants. The gaseous olefines are found in coal gas; and both they and the vapours of other members of the series are found in considerable amount in several enriching gases. The vapour tensions of all up to the hexylenes are so high that their employment to improve the illuminating power of coal gas is open to no objection. An olefine appears to have an illuminating duty at least twice that of the member of the paraffin series having the same number of carbon atoms in the molecule.

Acetylene is the lowest member of another series of hydrocarbons. It is gaseous at ordinary temperatures; and it probably exists in quite small amount in coal gas. It can be consumed alone either in specially constructed burners or in small Bray burners; and it then has an illuminating power equivalent

* See *ante*, p. 525.

† "Journal of the Chemical Society," Vol. XLVII., p. 200; or "JOURNAL," Vol. XLV., p. 435.

‡ "Journal of the Chemical Society," Vol. LXXI., p. 449.

§ "JOURNAL," Vol. LXIII., p. 485.

* "JOURNAL," Vol. LXVIII., pp. 367, 458, 501; and Vol. LXIX., pp. 349, 409, 476.

† "Journal of the Chemical Society," Vol. XLVII., p. 235; or "JOURNAL," Vol. XLII., p. 975.

‡ "JOURNAL," Vol. LXIII., p. 485.

§ "JOURNAL," Vol. LXII., p. 720.

to the following number of candles under standard conditions of testing:—

213·0	according to	Herr H. Gerdes	("JOURNAL," Vol. LXIX., p. 1248).
229·6	,,	,, Dr. E. G. Love	(,, Vol. LXVI., p. 339).
240·0	,,	,, Prof. Lewes	(,, Vol. LXV., p. 169).

The duty of acetylene as an illuminant diminishes on dilution; and small additions of acetylene do not increase the illuminating power of coal gas in proportion to their amount and its specific lighting power. When not more than 2·1 per cent. of acetylene is added to coal gas, each 1 per cent. increases the illuminating power by only 1 candle.* With about 4·5 per cent. of acetylene, every 1 per cent. increases the illuminating power by 1·12 candles (Professor V. B. Lewes†), or 1·46 candles (Dr. E. G. Love‡). Thus acetylene in mixtures with coal gas has not a lighting value at all comparable with its value *per se*; and though an excellent component of an illuminating gas in virtue of its gaseous condition at ordinary temperatures, as an illuminant either in coal gas itself or as an enricher thereof by a few candles, it is inferior to ethylene. Allylene occurs in small quantities in coal gas, and is gaseous at ordinary temperatures. Crotonylene is a liquid boiling at 64·5° Fahr. Its vapour is found in small amount in coal gas, and in enriching gases.§ The values of allylene, crotonylene, and higher members of the acetylene series as illuminants do not appear to have been precisely determined.

The naphthenes are a series of hydrocarbons isomeric with the olefines, but consisting of hydrogen addition products of the benzenes. They occur in Russian petroleum; and their vapours are doubtless found to a small extent in some enriching gases.

The lowest member of the benzene series of aromatic hydrocarbons—viz., benzene—is the most important illuminant in coal gas. It is a liquid boiling at about 177° Fahr., and having a vapour tension at 32° Fahr. of 25·31 mm. Therefore, 3·33 per cent. of benzene vapour saturates gas at that temperature. It is impossible to burn benzene vapour with a smokeless flame unless it be much diluted; and the illuminating value obtained by different observers from diluted benzene differs greatly. Drs. Frankland and Thorne have ascribed to it an illuminating power equivalent to about 420 candles‖; and Knublauch, one of 820 candles.¶ The effect of additions of benzene vapour to disilluminated coal gas has been studied by several observers. The following are some results:—

Percentage of Benzene Vapour by Volume.	Candle Power of Gas Produced.	Candles per 1 per Cent. of Benzene Vapour.	Authority.
1·00	14·07	14 03	Dr. H. Bunte ("JOURNAL," Vol. LXII., p. 720).
1·44	16·56	11·50	,,
2·31	20·70	8·96	,,
3·09	22·92	7·42	Dr. P. F. Frankland ("Journ. Soc. Chem. Ind.," Vol. III., p. 271).
3·63	30·00 (*a*)	8·26	Mr. W. Irwin (JOURNAL," Vol. LXVI., p. 140).

(*a*) Flat-flame burner.

Here, as with ethylene, the illuminating value of the methane in the disilluminated gas has a very marked effect on the tests at low candle-powers, and gives the benzene vapour a fictitious value. The duty of the benzene diminishes as the candle-power rises. At the low candle-powers corresponding to unenriched coal gas, benzene vapour, volume for volume, appears to be about eight times as efficient an illuminant as ethylene. The illuminating value of the vapour is so high that notwithstanding the comparatively low vapour tension of benzene, the volume which gas can retain at 32° Fahr. suffices to give disilluminated gas an illuminating power of more than 23 candles. For enrichment by a few candles only, benzene is therefore a trustworthy enriching vapour, provided the gas is not cooled greatly below 32° Fahr. There is about 0·9 per cent. of benzene vapour in coal gas; and it is the most potent enriching gas in many enriching agents.

Toluene is a homologue of benzene, and is found in coal gas in trifling quantities. It is a liquid boiling at 230° Fahr., and having a considerably lower vapour tension than benzene. At 32° Fahr., coal gas appears able to retain only about 0·4 per cent. of its volume of toluene vapour.** Disilluminated coal gas, according to Dr. Bunte, requires 1·04 per cent. of its volume of toluene vapour to impart to it an illuminating power equivalent to 15·57 candles under standard conditions of testing. This gives to 1 per cent. of toluene vapour an illuminating value of 14·99 candles.†† This is a higher value than any found for benzene. A very similar ratio between the effects of benzene and toluene on disilluminated coal gas was found by Mr. W. Irwin,‡‡ who further observed that xylene had a still higher illuminating value than toluene. But toluene and, yet more, xylene are of very little practical value as illuminants in gas which may be subjected to low temperatures, as the volume of their vapours retained by gas at 32° Fahr., is insufficient *per se* to give it the illuminating power of ordinary coal gas. Nevertheless toluene and xylene are found in many enriching gases, and occur in large quantities in the liquids deposited from the latter when they are subjected to cold or high pressure.

Naphthalene belongs to another series of the aromatic hydrocarbons. It is a solid boiling at 424° Fahr.; but it has a quite appreciable vapour tension at temperatures considerably below its boiling point. There is little doubt that even dry coal gas retains at ordinary temperatures traces of naphthalene vapour; and it is found in most enriching gases. The vapour of naphthalene is a very powerful illuminant. Tests made with a flat-flame burner by Messrs. Foster and Dibdin, on coal gas containing a known amount of the vapour, show that it has an illuminating power equivalent to 930 candles under standard conditions of testing.* According to tests with a flat-flame burner by Mr. W. Irwin, 1·07 per cent. by volume of naphthalene vapour appears to impart to disilluminated coal gas an illuminating power of 23·8 candles. Therefore 1 per cent. has a value of 22·34 candles.† Volume for volume, naphthalene vapour thus appears to be about twice as efficient an illuminant as benzene vapour. Naphthalene is doubtless responsible for some part of the high candle-power of imperfectly condensed coal gas; but unless the gas is to be kept at a high temperature up to the point of consumption, it is useless as an enriching agent on account of its very low vapour tension at ordinary temperatures. It is a constituent of badly condensed enriching gases. Of theoretical interest is the fact recorded by Mr. W. Irwin,‡ that phenanthrene has a still higher illuminating value than naphthalene.

The hydrocarbons existing in coal gas, as well as a few others, have now been considered, and some generalizations from the facts known concerning their values as illuminants may be attempted, though it must be remembered that very few of the hydrocarbons have been studied in a manner which justifies much dependence being placed on the results recorded. It appears, however, that homologous hydrocarbons show greater illuminating value as the number of carbon atoms in the molecule rises. This seems true even if the weight of the hydrocarbon gas or vapour be taken for comparison, though then the increase per carbon atom is but slight. For equal volumes of gas or vapour, the increase naturally is quite considerable. If there were sufficient data for a comparison of the illuminating values of the corresponding—*i.e.*, having the same number of carbon atoms to the molecule—members of the different series of hydrocarbons, there would probably be found to subsist a pretty constant ratio between the series. Thus the olefines appear to have at least twice, and the benzene hydrocarbons at least four times, the illuminating value of the corresponding paraffins for similar volumes of the gas or vapour. Equal weights would form a better basis of comparison; but as existing data are inadequate, it is useless now to pursue the subject further. Gas analyses are usually expressed in volumes per cent.; and, therefore, in these notes the values of the different hydrocarbons have been deduced for percentages by volume; and (except where others are specifically mentioned) tests made with the argand burner only have been quoted. Though gas is more often consumed from other burners, unenriched and slightly enriched coal gas is always officially tested by consumption in an argand; and therefore enriching agents must, from the gas engineer's standpoint, be judged by their relative effect on the coal gas argand flame.

The proportion in which the different hydrocarbons present in coal gas contribute to the luminosity of its flame can be approximately deduced. The percentages of the important hydrocarbons in the gas are about as follows: Methane, 36; ethylene, 2·5; benzene, 0·9. Thus for every volume of benzene vapour present, there are about three volumes of ethylene, and forty volumes of methane. But the illuminating efficiency of these hydrocarbons appears to be about in the following ratio: methane, 1; ethylene, 12·5; benzene, 100. Therefore benzene vapour seems to be responsible for about nine-sixteenths, and ethylene for about three-sixteenths of the total luminosity of the standard testing-flame of coal gas. Recognition of the approximate values of the illuminants in the unenriched coal gas is most valuable when the effect of additions of either of them on such gas is under consideration. It is essential that the hydrocarbons which are added should act harmoniously with those already present in the gas. If this harmony be lacking, the highest attainable economy in enrichment has been missed.

Enrichment of coal gas by a few candles may be effected by several methods. They may be suitably grouped under five classes—viz. (1) The addition of richer gas produced by a similar process to coal gas from cannel and other highly bituminous coals and shales. All such gas may be broadly called "cannel gas." (2) The diffusion in the coal gas of vapours of hydrocarbons of high vapour tensions. This method is briefly known as "carburetting." (3) The addition of gas produced simply by the destructive distillation of hydrocarbon oils. This

* "JOURNAL," Vol. LXV., p. 1068.
† *Ibid*, Vol. LXV., p. 1068.
‡ *Ibid*, Vol. LXVI., p. 340.
§ *Ibid*, Vol. LXVIII., p. 368.
‖ "Journal of the Chemical Society," Vol. XXXIII., p. 63.
¶ "JOURNAL," Vol. XXXVI., p. 293.
** "JOURNAL," Vol. LXIII., p. 485.
†† *Ibid*, Vol. LXII., p. 720.
‡‡ *Ibid*, Vol. LXVI., p. 139.

* "Transactions of the Incorporated Gas Institute," 1891, p. 73.
† "JOURNAL," Vol. LXVI., p. 139.
‡ *Ibid.*, Vol. LXVI., p. 139.

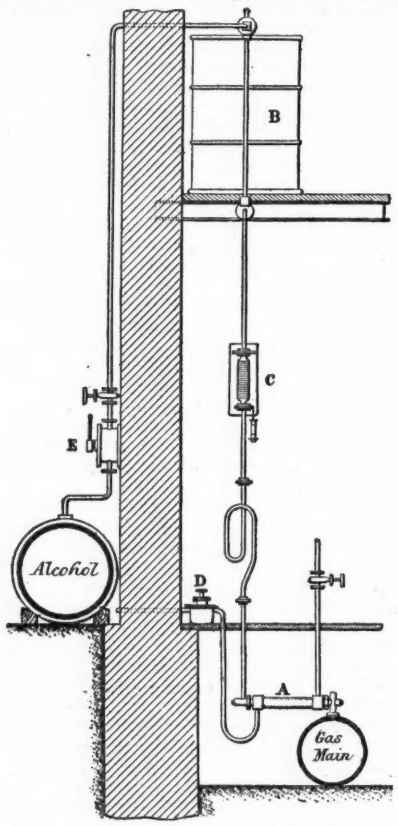
gas is briefly known as "oil-gas." (4) The addition of water gas carburetted by the products of the destructive distillation of hydrocarbon oils. This gas is spoken of as "carburetted water gas." (5) The addition of simple gaseous hydrocarbons produced synthetically. Acetylene is the only suitable hydrocarbon so made on a commercial scale.

In considering the relative merits of these methods of enrichment, attention will be drawn to the nature of the illuminating hydrocarbons present in the enriching gas or vapour. Such a study, if based on sufficient and reliable data, should indicate the inherent economy of each method, since the efficiency and suitability of the hydrocarbons are fairly well known. It should also show whether, on admixture, a loss of efficiency due to the incompatibility of the constituent hydrocarbons of coal gas and of the enriching gas is probable. Unfortunately, this study must at present necessarily be very superficial, as adequate data for its close pursuit are lacking. So far only tentative efforts have been made to raise the art of gas-enrichment from the empirical and rule-of-thumb stage; but they serve to indicate the growing sense of the inexpediency of an extended halt thereat.

(To be continued.)

THE PREVENTION OF NAPHTHALENE OBSTRUCTIONS.

Reference has already been made in the "JOURNAL" to the apparatus devised by Dr. Bueb, of Dessau, for preventing the freezing of service-pipes by submitting the gas, before it leaves the works, to the action of the vapour of alcohol in such a way as to remove the cause of obstruction without reducing the lighting or heating power of the gas. An inconvenience attending the arrangement is that it entails a larger consumption than is required for dealing with obstructions locally. But, on the other hand, it is claimed that by its adoption there is economy of installation and manipulation, less liability to accident, and greater satisfaction on the part of the consumers. The appliance in question, which has been for some time in successful operation in Dessau and elsewhere, was brought under the notice of the



Société Technique du Gaz en France, at their last meeting, by M. Syssoyeff. It may be mentioned that Dr. Bueb's investigations into the subject of the obstruction of pipes by naphthalene led him to the conclusion that the process best capable of yielding good remedial results without prejudicially affecting the light-giving property of the gas, should have for its object neither the getting rid of the moisture by drying, nor the removal of the benzol (though the latter, by its solidification, may be the true cause of the obstruction). His solution of the problem was the addition of vaporized alcohol to the gas. His apparatus is shown in the accompanying illustration. It consists of an evaporator A, a reservoir B, an admission regulator C, a receptacle for condensation water D, and a pump E. The alcohol is pumped from the barrel shown into the reservoir, whence it flows to the regulator, where any excess can be checked. It then passes on to the vaporizer, which is heated by a small jet or current of steam. The vapour of the alcohol immediately mixes with the gas in the pipe communicating with the main. A table was given showing the consumption of alcohol necessary for treating certain quantities of gas at two different temperatures. With an output of 35,300 cubic feet per hour, the alcohol must be added at the rate of 0·21 pint per minute when the temperature is 14° Fahr., and of 0·26 pint when it is down to 4° Fahr. These quantities rise in proportion to the bulk of gas up to 70,000 cubic feet; but for 80,000 cubic feet it would be necessary to use 0·23 pint and 0·30 pint every half minute at the above-named temperatures, and so on proportionately. For an output of 212,000 cubic feet (the largest quantity given in the table), the amounts required would be 0·63 and 0·80 pint respectively.

PACIFIC COAST GAS ASSOCIATION.

Annual Meeting at San Francisco.

(Continued from p. 479.)

Mr. F. H. Eichbaum, of San Francisco, submitted a paper entitled "Reminiscences of Gas Manufacturing and Kindred Matters," dealing principally with details relating to his first introduction to the gas industry. Among other things he described the Aubin gas process, by which gas was made from cotton seed and resin, in bowl-shaped retorts, having heavy covers, and lutes charged with molten lead. The covers had a projecting flange about 3 inches deep, which dipped into the lead and made an effectual seal. At the time all that was known of petroleum was its use in small quantities for medical purposes. He next described air carburetting machines, of which a very large variety were introduced, and which were known at a much earlier date than the modern "water-gas" system. He had also considerable experience with pitch pine as a gas-producing material. The light wood or "fat pine" was nearly all resin; and if it were obtainable, it would still find a ready demand among gas makers.

Some conversation followed the reading of the paper, and Mr. Clements said that at one time he used a large quantity of the pitch pine; but the wood was now scarcer, so he did not use it. The gas was good, but somewhat difficult to purify. Mr. Kahn, referring to the fact that in Mexico gas was made from wood, said that California was the greatest timber country in the world, and he was surprised to find that wood was not more generally used in the district, especially after the accounts of difficulties in connection with the coal supply to which they had listened that day. To this the President replied that, in his experience, the woods of that State were not sufficiently charged with resin or such-like substances, to be worth transporting any distance for gas making. More success had been obtained with seeds; and at Marysville he made excellent gas from castor beans for some time. Mr. Jones said that pomace from grapes was used at places where it was largely produced, and yielded excellent gas and also a very pure charcoal.

Mr. G. I. Kinney, of San Francisco, followed with a paper on "The Welsbach Light." It was a good educator in training people to require more light, and few who had used it successfully cared to return to the old system. The gas supply must be of good quality, and the pressure uniform, to ensure success. If a mantle was dirty with soot, the burner should be properly cleaned, and then if allowed to burn for a short time at half power, the soot would burn off and disappear. For a large number of lights a mercury sealed governor was desirable; but for few lights, or in case of a fuel supply from the same meter, a suitable volumetric governor should be fitted to each burner. In adjusting the apertures in the burners, the rule should be to give the lowest possible quantity of gas. When first lighted, the flame should fill the mantle sufficiently to give a bright incandescence up to within three-quarters of an inch from the top. In a few minutes this would creep up another half-inch or so, and a much better quality or colour of light would be produced, than if more gas were used, and there would be no overheating or bending of the mantle supports. Thus adjusted, the consumption from a No. 34 burner was 2·4 to 2·8 cubic feet, and that from No. 33 or No. 35 burner was 2·0 to 2·3 cubic feet, according to the kind and quality of gas used. By this simple plan, immunity from the usual complaints of mantle or glass breaking, smoky or discoloured lights, &c., was secured; and by turning the gas on full and holding the match several inches above the top of the chimney, there would be little or no explosion when lighting. A bye-pass with a pilot light inside the mantle could also be used. He considered that the mantles had lately been improved in respect to economy of gas and quality of light. The average duration of a mantle, as was shown by statistics embracing several thousand, was eight months; and this might be improved by systematic inspection. When fixing a mantle, the appliances should be thoroughly cleaned throughout and especially at the wire-gauze tip, and when placing the light for the first time it was a good plan to explain its character to the customer, and thus encourage confidence from the start. In concluding, he enlarged on the necessity for teaching the consumers how to get the best possible value from the gas; and

he said that, when properly used, the Welsbach system always gave satisfactory and permanent results.

A paper entitled "Incandescent Gas and Electric Lighting: A Comparison," by Mr. W. Gillespie, of San Francisco, was then taken. The author dealt generally with the advantages of the Welsbach, as compared with incandescent electric lighting, and said it had displaced many thousands of electric lights throughout the country, and had placed many gas companies in a position to defy the electric light. While the consumption per burner was certainly less, the Welsbach was bringing in new business that could not have been secured by any other medium. In regard to accessories, a great variety of globes and shades had been introduced, and also a system of ignition by electricity; so that all the advantages of the electric light could be secured, together with the economy and reliability of gas. The electric light companies set an example, in regard to care and attention to lamps and accessories, that gas companies would do well to follow. In San Francisco there was a system of regular inspection; and the consumers were also furnished with addressed post-cards for forwarding to the gas-works in case of complaint. A special staff of men was employed, wearing caps and badges bearing the words "Welsbach Gas Light," so that they could be identified and called in by any gas consumer, and at the same time advertised the lights.

The two papers were then placed before the meeting for discussion, and Mr. Ewing remarked that the introduction of this system in America was due to the enterprise of the United Gas Improvement Company, who sent an agent to Germany to inquire into the matter. It had proved a great blessing to the gas industry and would continue to do so. Mr. Summers referred to the use of the burner for street lighting, and said it might be successfully applied, though at present very little had been done in the United States in this way. Some trouble was caused by insects getting into the holes in the bunsen burners; and to remedy this, gauze was wrapped round the burner. The President said that at Napa he had substituted Welsbach lights placed 100 yards apart, for arc lights, with success, as the general impression was that the streets were better and more uniformly lighted.

The next item was a paper entitled "Changing a Coal Gas System to the Use of Natural Gas," by Mr. J. Kempf, junr., of Salt Lake City, Utah. The Company owning the natural gas wells 13 miles from the city agreed to supply gas to his mains, and he was to supply valves and regulators for reducing the pressure to the usual distributing limit. This was carried out in 1894 and 1895. The natural gas was not a success with ordinary burners, as it gave a poor light and if turned full on would blow out. But it answered admirably with the Welsbach. Some trouble and complaint were experienced till this point was fully appreciated. But as the price for the natural gas was 2s. 1d., against 9s. 2d. previously charged for coal gas, this soon subsided. The bunsen and other atmospheric burners in use were also unsuitable; as if a blast was applied to natural gas, it would go out. But with proper burners and pilot lights to keep the gas from going out, better results were obtained than with coal gas. Eventually the natural gas was delivered into the existing holders, and supplied under exactly the same conditions of pressure, &c., as coal gas; and by changing burners, or regulating the air and gas supply, all difficulty and complaint had been remedied. The whole district had been put entirely under natural gas supply since November, 1895. But it soon became apparent that the natural gas was limited and uncertain. After several partial failures, some coal gas benches were put into use in November 1896, and had remained in use ever since, making coal gas that was mixed with the natural gas. This secured the consumers against the difficulties caused by any deficiency in the supply.

The President called upon Mr. H. Adams to give his experience with natural gas. Mr. Adams said that he had two sets of mains, and supplied coal gas through one and natural gas through the other. The price of the coal gas was 8s. 4d., or 7s. 3½d. per 1000 cubic feet if used for fuel, and natural gas from 4s. 2d. to 2s. 1d. per 1000 feet, according to quantity consumed. There was a large demand for the latter; but it would not burn in an open burner, though it was a success with the Welsbach, of which there were about 6000 in use. Several private owners used the natural gas for both lighting and heating, and he had applied waste gas under both boilers and retorts. As a fuel, about 40,000 cubic feet of it were equivalent to a ton of good steam coal. The pressure of the gas at the top of the boring was 40 to 45 tenths. It came up from a depth of 1500 to 2000 feet, and was accompanied by warm salt water, which he turned to account by providing bath houses for his customers. The President remarked that, in most cases, the natural gas was accompanied by salt water.

A paper on "The Management of Lighting Plants in Small Towns" was read by Mr. T. D. Petch of Eureka, who remarked that as the majority of small gas companies in the district also operated electric light plants in conjunction, he had enlarged the scope of his paper so as to cover both systems. The manager of a large works had men to carry out his orders and attend to details, but the small manager had not only to plan, but also to carry out, the work. As a rule the ordinary manager of a small works was not so careful in respect to details as he should be, and was apt to make shift with anything that came handy But the axiom, "anything that is worth doing at all is worth doing well," applied to small gas-works as well as other things. The main and service laying, in particular, was often done in a rough-and-ready way, with marked results on the leakage account; and the author gave examples, and pointed out necessary details for securing good and sound work. He considered sheet lead washers better than leather ones for union couplings. Meters should be set in a dry even-temperatured locality, easy of access, and should be regularly painted, for which purpose oil tar was very suitable. They should also be tested at regular intervals, using a portable 5-light test-meter. The consumer was better satisfied if the test was made on his premises. Speaking of the retort-house, he recommended strong thick walls for the retort benches, and preferred the half-depth regenerator setting. One man could do anything between two small charges per day in summer to three heavy ones in winter, and the fire would take care of itself for four or five hours. The heat could be well regulated and the retorts would last three to four years. Each retort in such a setting would work off five 2½ cwt. charges in the twenty-four hours, yielding 6000 cubic feet per mouthpiece of 16-candle gas. No works should be without an exhauster; and the purifiers should be well looked after. The gas should not be too roughly cooled, or deluged with water in the scrubber. Having full possession both of gas and electric light business, anything in the way of a high-handed policy should be avoided, as there were always people working for an opportunity of organizing opposition companies, and a town of (say) 10,000 inhabitants or less, could not adequately support more than one company. It was absolutely necessary to gain the confidence of the public by fair and business-like treatment, and the successful manager was a live energetic man—who personally attended to every detail.

A conversational discussion followed, and Mr. Britton enlarged on the importance of securing the good will of the customers. A great deal depended on the man behind the counter. The manager could as a rule get good men in the retort-house, and for the mains and services, but he should personally watch the office and watch the meters.

In the course of a paper on "Practical Suggestions," read by Mr. C. E. Burrows, of Walla Walla, Wash., the author remarked that the fact of a works being small was no excuse for its being also inferior, either in design, material, or workmanship. He advocated plenty of space in the retort-house, open settings that contained no more material than was necessary to support and protect the retorts, and the use of a scraper the same section as, but slightly smaller than, the retort. By using this daily, he had been able to get retorts to work continuously for a year with no standing off for scurfing. He followed the same plan with the ascension pipes, using a steel disc nearly as large as the pipe, and never had a stopped pipe. The outside of the retort should be kept clean. He had never tried gaseous firing, believing that with a production of 25,000 cubic feet or less per day, the system would not pay. In letting down a setting, every crevice that would admit air should be carefully stopped, so that the cooling may be as gradual as possible. He worked four-hour charges, with 1½ to 2½ cwt. of coal in each charge, according to the demand. He had tried a steam-jet exhauster, but was convinced that the deposits of naphthalene caused by it more than counterbalanced the extra yield.

The reference to naphthalene had the usual effect of bringing a speaker to his feet who was badly troubled that way, followed by another who, working under very similar circumstances, did not know what naphthalene was. The statement that the steam-jet necessarily produced naphthalene was called in question, and it was pointed out that a sudden reduction in temperature from any cause would bring about the trouble.

Mr. C. O. G. Miller, of San Francisco, read a paper on the uniformity of gas accounts, suggesting a series of headings for the analysis of receipts and expenditure, similar to those recommended in the "Gas-Works Clauses Act, 1871," and explaining the allocation under each item. This he called form "A," and proceeded to give a system on similar lines suitable for a combined electric and gas business, called form "B." Next he submitted a monthly business statement, showing a statement of the receipts and expenditure divided under convenient headings, and similar statements for the combined undertakings, showing "gas" and "electricity" separately. Specimen forms were laid on the table, and Mr. Jones added forms illustrating the system used by the San Francisco Gas and Electric Company.

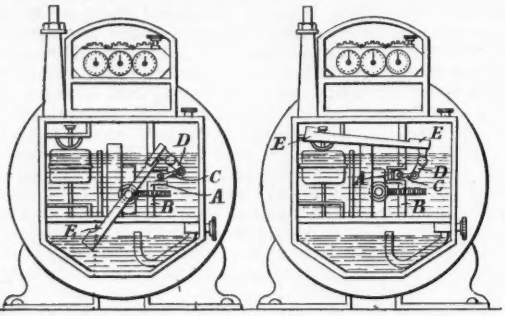
(To be continued.)

The Limerick Gas Managership.—The dispute has now been settled as to which body is to appoint the new Gas Manager at Limerick—the Gas Committee or the Corporation as a whole; the determination being in favour of the former body, which consists of the Mayor, two town councillors, and two gas consumers. The two councillors are nominated each year by the Corporation; while the other two gentlemen are elected every second year by the gas consumers as a body. The Committee met last Wednesday to consider the 40 odd applications sent in in response to the advertisement that appeared in the "JOURNAL;" and, after a lengthy deliberation, they postponed making any selection till the 15th inst., up to which date they are prepared to receive further applications for the position.

REGISTER OF PATENTS.

Compensating Wet Gas-Meters.—Glover, R. T. and J. G., of St. John Street, Clerkenwell. No. 21,775; Oct. 1, 1896.

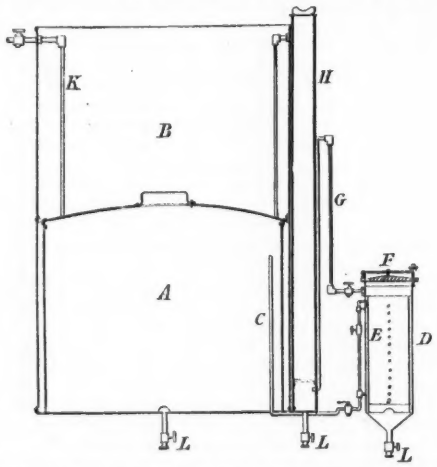
This improvement in compensating wet gas-meters consists in cranking the index-spindle, or fixing an eccentric or equivalent device thereon, and securing a lever to the end of the compensating apparatus, to which the necessary movement is imparted by a connecting-rod. Hitherto, the patentees remark, the compensating apparatus has been operated by a sharp rising cam, upon which an arm projecting from the compensating apparatus has rested, and by which the water-spoon has been alternately lifted and lowered at every revolution. But "this method engenders a certain amount of friction, which it is desirable to prevent."



As shown in the engraving, the crank A on the index-spindle B is connected by a lever C to an extension D of the compensating water-spoon E, whereby at every revolution of the spindle the compensator is lifted and lowered to the required extent, and for the purpose desired, "in an easy manner and with less friction than hitherto has been the case." The engraving shows the meter (with the front removed), with the spoon E in the two positions as operated by the crank A. The spoon is of the usual construction; the invention relating only to the means for operating it from a crank motion instead of by a cam, "whereby the spoon E is compelled to follow and continue its action."

Acetylene Gas Generator.—Smith, A. J. and A. G., of Aberdeen. No. 24,414; Nov. 2, 1896.

One form of this apparatus is shown in the engraving. To generate acetylene, carbide of calcium is put into the cage E, which is then inserted in the holder D, the lid of which is screwed down tightly at F. The tank B is filled with water; and as the gas is drawn from the holder A, the water rises over the arm of the U-tube C, which causes a small flow of water into the carbide holder. The water goes to the bottom of the holder, and gradually rises until it touches the carbide. The acetylene gas passes by the pipe G through the purifier H and into the gasholder, pressing the water down below the level of the arm of the U-tube, and preventing more water from entering the carbide holder until the gas is again used from the holder, when the operation is repeated.



The water, it will be noted, is not poured on to the carbide, but gradually attacks it from the bottom, and rises in the holder until all the carbide is converted into lime—the water surrounding the cage all the time the gas is generating tending to reduce the heat generated by the chemical action. Stopcocks are provided on the water and gas pipes, by means of which the carbide holders can be shut off from the gasholder. K is the gas-delivery pipe. L are stopcocks for emptying the gasholder, purifier, and carbide holders respectively.

Manufacture of Acetylene.—Resener, P. de, and Luchaire, H. L. A., of Paris. No. 24,440; Nov. 2, 1896. Date claimed under International Convention, June 8, 1896.

This apparatus comprises four principal parts (see fig. 1): A vat or vessel A filled with water; a gasholder or bell B immersed in the water contained in the vat; and two receivers C and C¹ for the carbide of calcium. The apparatus is combined in such a manner that the reserve of carbide stored in the receivers shall be sufficient to fill the holder a certain number of times; the gas being manufactured according to consumption. It is thus necessary, whenever the holder is nearly empty, to cause water to enter the carbide receivers in quantity sufficient to generate the volume of acetylene necessary for refilling it; and fig. 2 shows one of several plans proposed by the patentees to accomplish this result automatically.

Fig. 1.

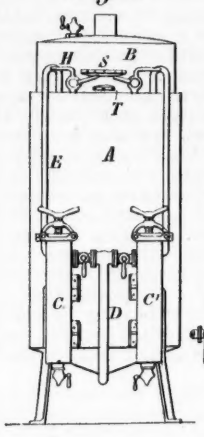
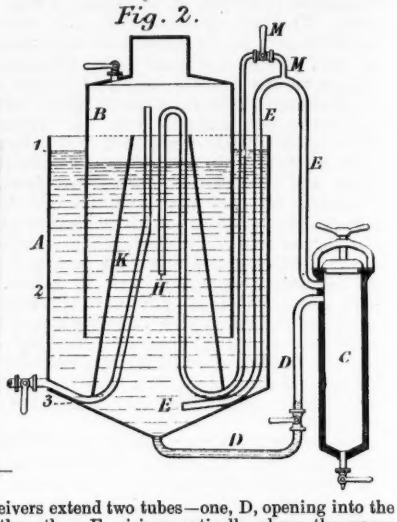


Fig. 2.



From the carbide receivers extend two tubes—one, D, opening into the lower part of the vat; the other, E, rising vertically above the upper edge of the vat, and then bending over and descending into the water, and opening a little above the conical bottom of the vat. From this arrangement, it results that the water in the vat, even when the cock on the pipe D is open, cannot enter into the carbide receiver, assuming that it be closed hermetically. Moreover, the acetylene generated is caused to traverse the whole column of water in the vat, so that it is effectually washed.

The water-level in the pipe D does not rise above the line 3—that is to say, the normal level. But the level rises in the part of the pipe E immersed in the vat A up to the line 1; this being the upper level. To disturb this equilibrium, it is necessary that a third pipe H, communicating with the upper part of the receiver, shall open into the water above the level of flow, indicated by the line 2—that is, the level to which the water in the pipe D must rise in order to enable it to flow into the receiver. The air then escapes through the end of H; and the water rising in the pipe D runs into the carbide receiver, where it replaces, in equal volume, the air or gas discharged therefrom. But since only a small quantity of water is required to fill the holder with gas, it is indispensable to arrest the flow of water into the receiver C in time; and this movement may be effected in several ways.

In the arrangement shown in fig. 2, the end of the pipe H is fixed, and is above the level of flow 2; but this pipe is provided with a cock M, which, when open, allows the water to flow through the pipe D into the receiver C. It is thus sufficient to secure to the holder two projections S and T (see fig. 1) adapted to engage with the lever of the cock on the pipe H—the projection S to open the cock when the holder descends, and T to close it when the holder rises again. A metallic cone K mounted on the bottom of the vat guides the bubbles of gas, and compels them to pass into the bell, even when the latter is at the top of its travel.

Gas-Generators.—Hennessy, T., of Kansas City, U.S.A. No. 28,718; Dec. 15, 1896.

This invention relates to a duplex generator and carburetter for making water gas and other similar products from bituminous or anthracite coal. It "consists in the construction, arrangement, and combination of parts" described and claimed in a lengthy specification, which is not understandable apart from the five sheets of detail drawings accompanying it. The principal claim is: The combination with the generators—having fire-chambers and charging hoppers therefor, the hoppers having diagonal passages leading to the fire-chambers thereof—of the superheater, having an interior checker-brick construction; generators and superheater formed in the same structure; an air-heating appliance supported above the superheater for heating and conveying secondary air thereto, and consisting of an annular hood having communication with an annular chamber located in the top of the superheater; air pipes or passages for conveying primary air to the generators; passages for conveying air and the products of combustion from the generator to the superheater; an oil-pipe communicating with a coil vaporizer or atomizer at the upper end of the superheater; a water-gas pipe leading from the generators to the upper end of the superheater; and a connection between the oil-pipe and water-gas pipe.

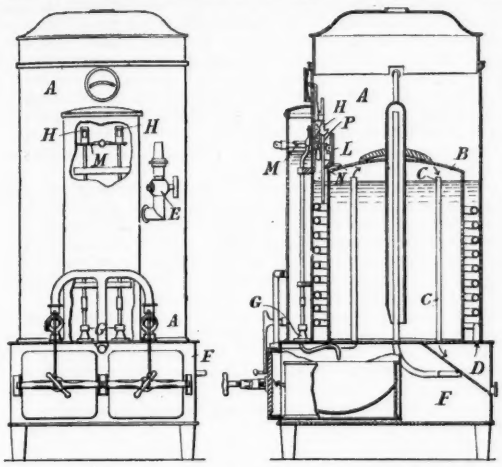
Acetylene Gas Generators.—Spence, H. K., and Beveridge, A., W. G., and S. M., of Kirkcaldy. No. 29,554; Dec. 23, 1896.

This form of plant is shown—in elevation (partly in section) and in section—in the engraving; the generation of acetylene being carried on in two carbide chambers.

A is a tank (closed at the bottom, but having a removable top) inside which is a gas-containing bell B. The vessel A is filled with water to the required height, and the bell dips into it; the bell rising and falling according as the bell is being filled and exhausted respectively. The centre of the tank has an upright tube C which leads the generated gas from the inside of the bell, down through the lower end of the generator into the chamber D (surrounded by water, whereby the gas is cooled), then through an ordinary coil and out to the gas-supply pipe E. Below the bottom of the tank is a casing F, to contain two carbide chambers; a space being left below, between, and around the chambers for containing water, whereby they are kept cool. Upon the top of F—within the space occupied by the two carbide chambers—are situated valves G, for allowing the necessary quantity of water to be supplied to the carbide. Each of the valves is operated by an upright rod formed with a slotted

portion, within which works the end of two hinged projections or catch-pieces H, secured within the tank A; the said projections H engaging with actuating stops provided at the top of the bell.

The bell being charged and in its highest position, as it descends according as the generated gas is consumed, one projection on the bell strikes one of the projections which operate the valve-rods, so that the valves are opened and a supply of water allowed to run into the one carbide chamber. When that one chamber is exhausted, the other stop is automatically caused to strike the projection operating the other valve-rod to supply the necessary amount of water to the other carbide chamber. At the top of the one side of the bell there is a fixed horizontal plate-piece L, lying flat on the front of which is another plate held in guides, and made to move sideways. One end of this moveable plate has a stop, which comes in contact with one of the hinged projections H of the water valve-rods. Situated at the upper ends of these rods is a



horizontal arm-piece or lever M, pivoted at the centre of its length to the side of the water-tank. To start the apparatus, the arm is operated so as to raise one arm of the lever M and lift the water valve-rod, and thus allow a supply of water to fall on to the carbide. The generated gas immediately passes into the bell, which rises until it is filled. As the gas is consumed, the bell descends until the one stop on the side of the bell strikes one of the hinged projections H at the top of the water valve-rod. The valve is thus opened again, and another supply of water is dropped on the carbide, and generates a further supply of gas. The bell thus rises again automatically; and the same action goes on until the gas in one chamber is nearing exhaustion.

This exhaustion causes the bell to fall to such a lowness that a V-shaped stop N at the centre of a sliding bar on the bell B strikes one of two projections P, secured to the inner side of the tank A, at a point below the top of the water valve-rods. The sliding bar on the bell is thus shifted to one side, which brings another stop on the other end of the sliding bar in contact with the projection H of the other water valve-rod, whereby the valve is opened and the supply of water given to the other carbide chamber.

Production and Consumption of Acetylene Gas.—Thompson, W. P.; a communication from the Deutsche Acetylengas-Gesellschaft mit Beschränkter Haftung, of Berlin. No. 10,249; April 24, 1897.

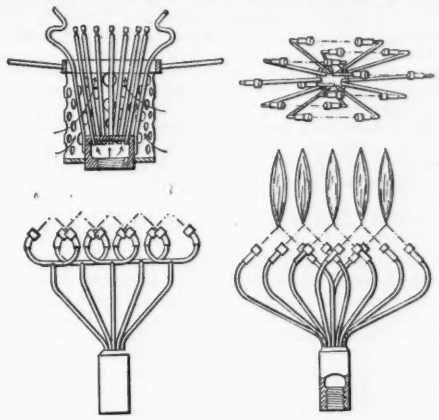
The week before last a description was given (p. 438) of one arrangement patented by the above-named Berlin Company for the manufacture of acetylene. The object of the present invention is to provide portable lamps in which the illuminating agent is developed from carbide of calcium by water fed on to it, and it particularly has reference to means for regulating the entrance of water to the carbide and the escape of gas from the generator; also to means for keeping the generator at a comparatively low temperature, while the gas issuing from it is not (or not appreciably) cooled in its path to the flame.

Water-Meter.—Pfeil, C., of Hessen, Nassau. No. 12,815; May 24, 1897.

In this water-meter the duration of the period of consumption is indicated by clockwork on a dial. The valve-spindle of the stop-valve is prolonged to an extent sufficient to carry a screw-thread of quick pitch, which gears with the correspondingly milled end of a rod bent at right angles—the operation of the valve-spindle serving to move the rod, which is guided on a supporting plate. At its upper end, the rod carries a leaf-spring, which enters a clockwork and bears against the escapement wheel. When the cock is closed, this leaf-spring bears against the escapement wheel, and therefore the clockwork is stopped; but on opening the cock and rotating the spindle, the rod is drawn downwards. The leaf-spring then releases the escapement wheel, and the previously wound up clockwork begins to act.

Burners for Acetylene Gas.—Schülke, J., of Berlin. No. 12,928; May 25, 1897.

These burners for acetylene gas are composed of small capillary tubes, fixed in a chamber or cap screwed on to the gas-pipe, and so arranged that "the air coming from all sides is compelled to make its way in practically parallel streams directed uniformly to all parts of the flame." The patentee remarks that, heretofore ordinary gas-burners have not been applicable for burning acetylene gas for illuminating purposes, because carbon is deposited at the outlets, which reduces the lighting power of the flame, and ultimately causes stoppage of the openings—rendering frequent cleaning thereof necessary. These objections are obviated in burners constructed in accordance with the present invention, because the air for supporting combustion is conducted to them in a divided form; and the small flames of acetylene are drawn out into elongated flames by the gas pressure and the streams of air, which object can be still more perfectly attained by making the outlet openings of the capillary tubes of special form—ray or jet shape, or, preferably, so arranged that each two tubes are directed obliquely, or converging

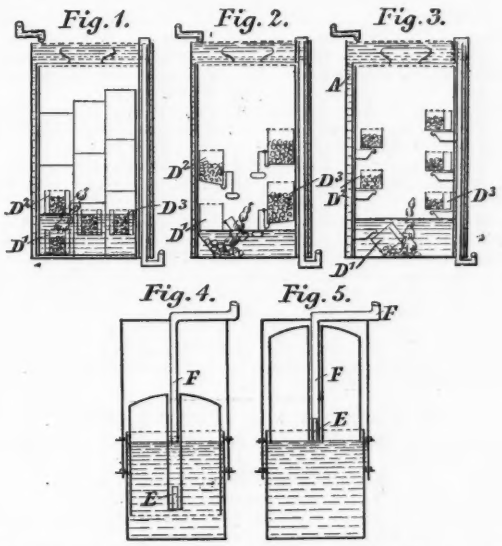


towards one another, as shown in the engraving. The streams or jets of gas issuing from them therefore strike against one another at an angle, and after their combination produce a flame which "forms a flattened and comparatively large light-emitting surface."

Producing Acetylene Gas.—Trendel, F., of Berlin. No. 14,015; June 8, 1897.

This device for generating acetylene gas is characterized by the arrangement of several calcium carbide receptacles, in such manner that the water rising in the generator shall cause the contents of the receptacles to be successively precipitated into, or covered with, water.

Figs. 1, 2, 3 are three different arrangements for accomplishing this end; while fig. 4 shows a device for preventing excessive pressure in the gasholder, the bell being in about its middle, and fig. 5 in its highest position.



The generator in each case has a receptacle contained therein, and closed by means of a cover C, sealed by water. E is the outlet-pipe for the gas generated; and D^1 D^2 D^3 are the carbide receptacles or boxes. In fig. 1 these are floating boxes, which rise with the rising water, until each one successively engages a trip-device, whereby it is either turned over or sinks, emptying its contents into the water. In fig. 2, the carbide boxes are provided with hinged bottoms; and a hinged float device is adapted to keep the bottoms closed. As soon as the water rises, the float operates outwards, disengaging the catch and allowing the bottom of the receptacle to fall, thus emptying the contents into the water. In fig. 3, the carbide receptacles are balanced on ledges, so that the water on rising tips them successively off, and empties their contents into the water.

The device (figs. 4 and 5) for preventing excessive pressure in the gasholder, consists of a water reservoir and gasometer bell having a downwardly extending central tube open at both ends, and having mounted at its lower end a short piece of tube E; the annular space between the tubes being closed at the bottom, so that a fluid may be placed in the annular space formed between them. F is a central tube supported on a stand and extending down into the centre-tube. The operation of the device is that when the bell has reached its uppermost limit, and if gas is still entering, the end of the pipe F will dip into the annular space between the centre-pipe and E, and form a closure; but the superfluous gas will be able to escape through the lower end of the tube E into the tube F, and be led away.

Gas-Lanterns for Street Use.—Probert, E. E.; a communication from A. C. Niermeyer, of Deventer, Holland. No. 14,368; June 14, 1897.

The scope of this invention for a gas-lamp adapted specially for use with incandescent gas-burners is sufficiently indicated by the formal claims advanced by the patentee—viz., 1. The combination and arrangement of parts for incandescent gas lamps and burners, consisting in a lever or

part secured to the plug of the valve to the main burner, and which is actuated by inserting an igniter within the lantern or casing of such lamp; the act of inserting such igniter also opening a gas-passage to an auxiliary burner, which is ignited by the lamp within such igniter, while the withdrawal of the igniter causes the closing of the supply of gas to the auxiliary burner, while leaving the supply to the main burner open. 2. The improved arrangement of parts for igniting incandescent gas lamps and burners, consisting in a lever connected to the plug of the valve in the gas-supply pipe, and which lever is actuated by the action of inserting an igniter within the lantern or casing of the lamp, and of a hinged plate serving to lift a valve from its seat on a supply-pipe delivering gas to an auxiliary burner, the upper end of which terminates near the incandescent burner, and also of a second hinged plate serving to close the opening through which the igniter is inserted.

Incandescent Gas-Burner Mantles.—Steinbach, J. C. J., of Hamburg. No. 14,499; June 15, 1897.

In explanation of this invention, the patentee says mantles for incandescent burners, containing a thorium and a cerium oxide, give, when heated in a bunsen flame, and when about 99 parts of thorium oxide and 1 part of cerium oxide are used, the maximum illuminating power which can be obtained with these two materials, and a white light. With an increasing percentage of cerium oxide, the colour of the light turns to yellow, and the illuminating power decreases very considerably. Thus a mantle composed of about 96 parts of thorium oxide and 4 parts of cerium oxide gives a light of a yellow colour, and of a very considerably smaller illuminating power. Now, on adding about 25 per cent. of silicic acid to a mixture of 96 parts of thorium oxide and 4 parts of cerium oxide, the colour of the light emitted is no longer a pronounced yellow, but is "pure white, and its illuminating power is even greater than that of a mantle or the like composed of 99 parts of thorium oxide and 1 part of cerium oxide." It may be stated that, as a rule, with the presence of silicic acid, the percentage of cerium oxide in proportion to the thorium oxide, in order to obtain the most favourable illuminating effect, must not be appreciably greater than is the case with mantles composed solely of thorium oxide and cerium oxide. The illuminating power of mantles containing silicic acid, generally increases considerably in intensity during the first ten hours of burning, and then remains constant during the whole time of burning, because "the several components have imparted to them by the silicic acid a considerably increased degree of refractoriness or resistance to the action of fire, which renders a volatilization of them impossible," while mantles which contain silicic acid have also a much greater resistance or strength, and are therefore better able to withstand external influences. The considerable influence exerted by silicic acid is also shown by the fact that a mantle of thorium oxide and cerium oxide weighs about 600 milligrammes, while the same body of exactly the same dimensions, but containing about 20 per cent. of silicic acid, has only a weight of about 350 milligrammes.

The patentee proposes to produce a pure solution of silicic acid from a dilute solution of alkaline silicates by the addition of acid, and the separation of the crystalloids and of the acid in excess by means of dialysis. The solution of silicic acid remaining in the dialysator is added to the solution of thorium and cerium; and the fabrics are impregnated in the usual manner. They may also be first impregnated with silicate of potassium or of soda "water glass," from which silicic acid may be precipitated in the fabric by means of suitable precipitating agents; and the soda salts or potash salts thus formed can be removed by washing. Or the fabrics may be impregnated with hydro-silico-fluoric acid; and, after drying, may be treated with ammonia, whereby silicic acid is separated and the fluor-ammonium is dissolved. Or the fabric may be impregnated with chloride of silicon, and the silicic acid be precipitated in the fabric in an insoluble form by means of water. The silicic acid fabrics formed in this manner would then have to be further treated with solutions of thorium oxide and cerium oxide.

APPLICATIONS FOR LETTERS PATENT.

19,319.—Barnard, E., "Generating and supplying acetylene or other gases." Aug. 20.

19,347.—Main, R. B., "Burners for gas-stoves." Aug. 21.

19,354.—Sugg, W. T., "Gas-burners." Aug. 21.

19,399.—M'Donald, R. W., "Bye-pass cocks and fittings for gas and the like." Aug. 23.

19,411.—Bell, H. J., and The Niagara Falls Acetylene Gas Machine Company, Ltd., "Production and storage of acetylene gas." Aug. 23.

19,437.—Flürscheim, A. A., "Mantles for incandescent gas-lights." Aug. 23.

19,536.—Ackermann, F. P. J., "Heating burners or stoves for use with acetylene gas." Aug. 24.

19,590.—Mooney, F. M., "Treatment of the oxide of iron used for the absorption of sulphuretted hydrogen in the purification of illuminating or other gases, or otherwise." Aug. 25.

19,601.—Johnson, A. T. M., "Gas lamps or burners." Aug. 25.

19,611.—Rippingille, F., "Oil and gas stoves." Aug. 25.

19,615.—Münsterberg, O., "Manufacture of acetylene gas." Aug. 25.

19,673.—Hayot, L., "Gas-turbines." Aug. 26.

19,709.—Bautze, W., "Burners for producing incandescent light by fuels of all kinds." Aug. 26.

19,717.—Fischer, J., "Glass globes or screens for use with gas or other burners." Aug. 26.

19,733.—Bolden, J., "Adjustable fittings for gas or lamp brackets." Aug. 27.

19,758.—Holliday, T., "Gas-burners." Aug. 27.

19,765.—Flürscheim, A. A., "Mantles or the like for incandescent gas-lights." Aug. 27.

19,807.—Attewell, T., and Hardstaff, W., "Gas-saving burner." Aug. 28.

19,823.—Thorp, T., and Marsh, T. G., "Production of acetylene from calcium carbide and water." Aug. 28.

19,833.—Tourtel, J., and The Tourtel Gas and General Engineering Company, "Coin-freed prepayment meters." Aug. 28.

19,887.—Harris, L. G., "Manufacture of gas from garbage and other refuse." Aug. 28.

19,889.—Lothammer, F. J., "Carburizing air." Aug. 28.

MISCELLANEOUS NEWS.

THE PUBLIC LIGHTING OF LIVERPOOL.

Adoption of a New Lamp for Incandescent Gas-Burners.

The following report by Mr. C. R. Bellamy, the Superintendent of Street Lighting to the Corporation of Liverpool, has been approved by the Lighting Committee, and was presented at the meeting of the City Council held last Wednesday:—

The incandescent gas-burner (Welsbach patent) came into practical use in 1893; and was first adopted in Liverpool for street lighting purposes in May, 1894. The advantage offered by this form of burner was a much higher light-efficiency, developing in Liverpool a maximum of 20 candles per foot of gas, as compared with 4 candles with the best type of ordinary flat-flame burner. For comparative purposes, it is necessary to base calculations on a much lower efficiency; as in practice it is found that there is a continuous depreciation of the mantle during use. A large number of tests of new mantles, and those that have been in use for varying periods between one and nine months, show that an average efficiency of 13 candles throughout the useful life of the mantle may be assumed. On this calculation, the incandescent gas-burner is shown to yield more than three times the light of the ordinary flat-flame burner consuming the same amount of gas.

The first experiment on a large scale in Liverpool was carried out in Lime Street, where 154 burners were fixed in the then existing high-power lamps, in clusters of two or three, in place of flat-flame burners. The gas consumption under the flat-flame system was exceedingly high—amounting to 4,291,319 feet per annum, which was at once reduced by the adoption of the incandescent gas-burners to 940,041 feet, effecting a saving in the gas charge of £502 13s. 10d. per annum.

The disadvantages attending the use of the incandescent gas-burner were principally the difficulty in lighting the burner surrounded by a glass chimney, and the fragility of the mantle, rendering frequent replacements necessary. Owing to the unsuitable construction of the Lime Street lamps, it was found, as the result of a year's working, that each burner required on an average the following renewals:—

Mantles	13
Chimneys	12
Mantle rods	3

Amounting in the aggregate, under the then existing prices, to an annual maintenance charge (including a labour item of 1s. 5d.) of 20s. 3d. per burner.

At that time, the most approved method of lighting was by means of a small bye-pass or pilot light, provided within the mantle, which remained lighted during the day, for the purpose of igniting the main supply when turned on by the lamplighter at lighting time. It was found, however, in practice, that these pilot lights were unreliable, a proportion of them becoming extinguished during the day—necessitating a special visit of the lamplighter with a ladder after completing the lighting of his district. Added to this was the deterioration of the mantle due to its use, and the cost of the maintenance of the pilot light; the consumption of gas for the purpose being assessed at 0·25 foot per hour, which amounted to an annual consumption of 1428 cubic feet, involving an addition to the ordinary lighting charge (with gas at 3s. per 1000 feet) of 4s. 3d. per burner per annum.

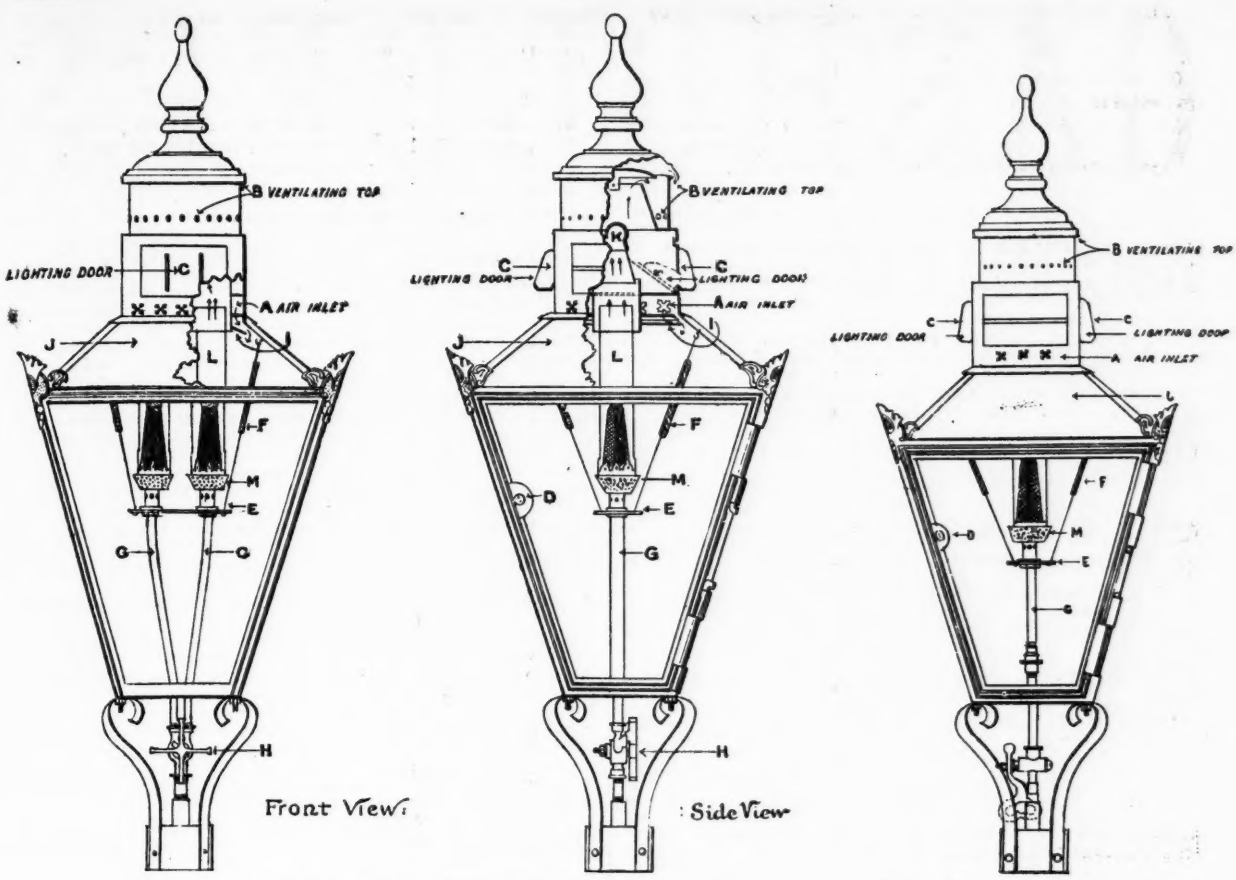
It was therefore found that, under the closest supervision, the renewals and the additional gas for the pilot light involved an aggregate annual charge of £1 4s. 6d. per burner in excess of the ordinary gas-burner, which was regarded as unsatisfactory.

Efforts were made to reduce this charge, by abolishing the pilot light, and lighting the burner by means of a match and ladder. This was found both costly and inconvenient to the public; and further efforts were made to obtain a lamp in which the burner should be used under the best conditions in respect of ventilation, suitability of position, freedom from vibration, and capable of being lighted by the lamplighter in the same way as the ordinary lamp—viz., by means of a torch and pole.

This resulted in the production of the lamp at present in use, and which is shown on the accompanying drawing. A is the air-inlet; and B the ventilating top. C are lighting doors; two being provided, fixed in line with the street, to enable the lamplighter to use the door on the side of the lamp opposite to the direction of the wind. The lamp is lighted by thrusting the torch through the lighting door into the box K, where the gas, escaping through the chimney L, is lighted. D is the cleaning door, with lock. As all the products of combustion are carried by means of the chimneys into the lighting box beyond the glazed portion of the lantern, internal cleaning is only necessary at long intervals. Frequent access is not, therefore, required; and the locking of the door prevents interference with the burners. E is the suspension platform. F are suspension wires and springs. The springs permit of the platform being depressed, which draws the glass chimney out of the copper chimney and permits of the renewal of the parts without disconnecting the platform E. G are flexible tubes. H is a three-way cock, for the double-burner lamp. This is so arranged that either or both of the burners may be used; the practice being to light both until midnight, and, with weekly alternations, one of the burners remains lighted until daybreak. I is an enamelled steel reflector, acting as a baffle-plate to the fresh air supply. J are opal glass reflectors. M is a wire gauze cup to prevent back-lighting. The lamp is lighted over the chimney, in the ordinary way, by means of a torch, with the same facility as an ordinary flat-flame burner lamp, and with no greater expenditure of time.

It has been stated at various times that the lighting of the burner over the chimney is detrimental to the mantle; but it has been found in Liverpool to be a distinctly beneficial process, as it does away with a continuous passage of air, laden with the products of combustion arising from a luminous flame and the dust of the atmosphere, due to the use of the bye-pass jet within the mantle during the hours of daylight. As a subsequent table shows that a number of mantles have been in use under this system for nine months, or 2341 hours, with an average efficiency at the end of this time of 10·39 candles per foot of gas, it must be admitted that this system of lighting is beneficial to the mantle, and is the most satisfactory yet adopted.

There are 1783 burners now in use, out of a total of 2051 ordered by



DOUBLE BURNER INCANDESCENT GAS-LAMP.

SINGLE BURNER INCANDESCENT GAS-LAMP.

the Committee to date. In 901 of these lamps, 882 are fitted with double and 19 with single burners; the total work ordered to date dealing with 19 miles of streets. A large number have been subjected to most severe tests, extending through the stormy autumn and spring of 1896-97, in positions embracing many of the streets of maximum heavy vehicular traffic and exposure.

It was thought desirable not to allow the lamplighters to undertake the renewals of the mantles, &c.; and an inspector has been appointed, whose duty it is to visit each of the lamps two or three times a week, under a carefully-organized route table, during the lighting hours, and to report daily upon the condition of the lamps and as to requisite renewals, which are ultimately carried out by an experienced and independent fitter. This special supervision and treatment, though most effective, adds 2s. per annum to the maintenance charge per burner; and it is hoped that ultimately it will be found practicable to transfer the work to the ordinary lamplighting staff under a greatly reduced charge.

A carefully-prepared register has been kept of each burner, showing the date of fixing, and all subsequent renewals, &c. An analysis of this has been made, which shows that a considerable number of mantles have been in use for over six months, and others for seven, eight, or nine months without requiring renewal. A number of these have been brought in for photometric testing, with the following results:—

Illuminating Power Tests of Incandescent Gas Mantles, removed from District.

Situation.	Date of Fixing.	Date of Test.	Months in Use.	Lamp Hours.		* Candle Power.
				H.	M.	
Sir Thomas Street	9 . 10 . 96	15 . 7 . 97	9	2378	57	34·03
Stanley Street	,,	16 . 7 . 97	9	2383	37	30·05
Ditto	,,	,,	9	2383	37	25·18
North John Street	14 . 10 . 96	15 . 7 . 97	9	2331	34	27·54
Ditto	,,	,,	9	2331	34	41·02
Cook Street	,,	,,	9	2331	34	28·47
Exchange Street East	,,	,,	9	2331	34	39·07
Ditto	,,	,,	9	2331	34	27·56
Ditto	15 . 10 . 96	,,	9	2322	6	32·59
Chapel Street	16 . 10 . 96	,,	9	2312	37	30·46
Ditto	,,	,,	9	2312	37	27·17
South Castle Street	29 . 10 . 96	7 . 7 . 97	8	2144	44	27·88
Chapel Street	5 . 11 . 96	15 . 7 . 97	8	2110	3	38·01
Harper Street	16 . 12 . 96	7 . 7 . 97	7	1609	43	26·43
Ditto	,,	,,	7	1609	43	26·19
Ditto	17 . 12 . 96	,,	7	1598	1	34·41
South John Street	24 . 12 . 96	,,	6	1516	3	32·03
Ditto	30 . 12 . 96	,,	6	1446	3	37·28
Ditto	31 . 12 . 96	,,	6	1434	23	34·80
Ditto	,,	,,	6	1434	23	30·36

* Consumption fixed by governor at 3 cubic feet per hour.

As already pointed out, the mantles in use for nine months show an average lamp-hour life to date of 2341, while the average useful life of the mantle over the whole of the system is found to be 1137 lamp hours. The average annual renewals per burner have worked out as follows:—

Mantles	2·60
Chimneys	2·30
Mantle rods	0·23

At a cost of 3s. 11d., to which is to be added the cost of supervision and labour of 2s. per burner, making a gross annual charge of 5s. 11d. in excess of the ordinary flat-flame burner, as compared with £1 4s. 6d. under the first system, being a reduction of 75 per cent. in the maintenance charge of the incandescent gas-burner due to the adoption of the new lamp.

For the purpose of enabling the Committee to arrive at an estimate of the relative value of the present incandescent gas-lamp as compared with the ordinary flat-flame burner lamp, the following table of the first cost and annual maintenance has been prepared:—

Description of Lamp.	Gas Charge at 2s. 6d. per 1000 Cubic Feet. Per Annum.	Average Illuminating Power.	First Cost of Lamp and Fixing.	Total Annual Charge.
	£ s. d.	Candles.	£ s. d.	£ s. d.
Double-Burner Incandescent Lamp	2 3 11	80	2 7 5	3 12 9
Single-Burner Incandescent Lamp	1 8 3	40	1 17 4	2 11 2
Ordinary Flat-Flame Burner	1 9 3	16	1 1 1	2 6 3

The above figures, which are useful for comparative purposes, do not supply the most important information—viz., the cost of fixing the new lamps in lieu of the existing flat-flame burner lamps, which is as follows:—

Double-burner lamps	£1 11 6
Single-burner lamps	1 1 5

These prices are lower than the first cost in the statement above, owing to the credit allowed for the ordinary lamp superseded, and which is taken into stock at 20 per cent. under first cost, for re-fixing in other parts of the city. This has rendered the further purchase of ordinary lamps unnecessary.

Though the experience of the past three years has conclusively proved that the incandescent gas-burner cannot be used with complete success in the ordinary form of lantern, and, therefore, a somewhat heavy first expenditure is involved in the adoption of the system, the subsequent advantages are so great, that a general extension appears irresistible.

(Signed) C. R. BELLAMY,
Superintendent of Street Lighting,
Gas Examiner, and Official Inspector of Gas-Meters.

THE STOCKPORT CORPORATION AND THE SUPPLY OF WATER GAS.

Our readers may remember that the Stockport Corporation some time ago applied to the Local Government Board for loans to the amount of £36,000 for carrying out extensions at the gas-works; but the application was refused on the ground that the scheme included plant for the manufacture of water gas, the supply of which had been objected to by many of the inhabitants on the score of danger. The result was that an interview took place with the President of the Board (Mr. H. Chaplin), and it was pointed out to him that only 25 per cent. of water gas would be used. To this the Board have no objection; for at the meeting of the Town Council last Wednesday a letter was read in which it was stated as follows: "The Board understand that the works which are now proceeding are urgently needed, and that it is requisite they should be proceeded with quite independently of the question whether the gas supplied should be coal gas only or a mixture of coal and water gas. The Board are satisfied, from the information which they have received, that the supply of water gas might be attended with serious results; and they have in contemplation the appointment of a Departmental Committee to consider the whole question. Some time, however, must elapse before such a Committee would be in a position to report, and having regard to the urgency of the works now proposed by the Town Council, the Board would be prepared to sanction the loans applied for, providing the Town Council pass a resolution that they will not supply water gas except when mixed with coal gas, and that under no circumstances shall the proportion of water gas in the mixture of coal gas exceed one-fourth; and for the supply of water gas, even under these conditions, the Town Council must accept the responsibility. The Board are induced to offer to sanction the loans, subject to these conditions, only by the desire to meet the wishes of the Corporation, and the fact that at present they have no definite information as to the danger attending the use of water gas under such conditions as these. It will, however, be understood that when the Committee which it is proposed to appoint have made their report, the matter will be subject to the reconsideration of the Board." The Council agreed to the terms of the letter, though the Chairman of the Gas Committee pointed out that water gas had been made in London for nine years; and he said he believed it was being consumed in the offices of the Local Government Board. There was no power to prevent the Corporation making carburetted water gas; all the Board could do was to prevent them borrowing money for the purpose. But the Local Government Board allowed them to borrow money for the buildings in which carburetted water gas was housed; and it seemed to him they were inconsistent. He mentioned two authorities who said that 50 per cent. of the gas was a safe amount to use; but in Stockport the proportion was only 11·3 per cent.

PROPOSED EXTENSION OF THE DUNDEE CORPORATION GAS-WORKS.

Report by Mr. W. Foulis.

The following report by Mr. W. Foulis, Gas Engineer to the Corporation of Glasgow, upon the proposed extension of the Dundee Corporation Gas-Works, has been received by Sir T. Thornton, the Town Clerk of Dundee:—

"Having carefully considered the various questions on which your Committee have requested me to express an opinion, and having also examined the gas-works, I have now to report as follows: The site of the existing works extends to about 9¾ acres. The works seem to have been extended from time to time without any well-devised plan, until now the whole area is occupied by plant capable of manufacturing 8½ million cubic feet per day, a much smaller quantity than could be manufactured in a properly designed works occupying the same area, and in which, by the more convenient arrangement of the apparatus and the introduction of mechanical appliances, a considerable saving in cost of production would be effected. Further extensions, more especially as regards gasholder capacity, are immediately required; and I would strongly recommend that any extensions now to be made should form part of a complete plan of reconstruction, so that the area covered by the works would be utilized to the greatest advantage. The vacant ground to the east of the existing works is the only ground in the neighbourhood available for extensions; and it should, if possible, be acquired, not so much for immediate use as for future requirements. I would therefore advise that, if not the whole, at least a portion of this ground should be purchased; that a well-considered plan of the works should be prepared, providing for future extension; and that the position and size of gasholders, and other plant immediately required, should be in accordance with this plan. I have prepared a sketch plan which may help you in considering these proposals. The proposed works are designed for an ultimate manufacturing capacity of 7½ million cubic feet, and would be constructed from time to time as required. The whole of the manufacturing plant would, according to this plan, be on the site occupied by the existing works. The high ground at the north side of the works, which is at present of little use, would be utilized for high-level sidings; enabling the coals to be stored in the coal-store with a minimum of handling. Only a portion of the ground proposed to be acquired would at present be needed. The other portion, if purchased, could probably be profitably let. The arrangement of the retort-house would be such that, whichever of the several mechanical devices for the manipulation of coal it was thought advisable to adopt, could be easily applied; and there would be sufficient yard room to enable coke, &c., to be effectually dealt with. The extra expense which would be incurred in carrying out these proposals would be considerably more than met by the saving in cost of manufacture which would result."

The sketch enclosed shows three retort-houses, side by side, each to contain 306 retorts, and each capable of producing 2½ million cubic feet of gas per day. The coal-store—of a capacity of 11,000 tons—is at the end, reached by a high-level railway. At the other end of the retort-house is an open yard, with a low-level railway traversing it. The condensers and scrubbers are against the wall of the retort-house and coal-store; and running parallel with them is the purifier-house, containing twelve boxes, and with the meter-house on the end of it. Three gasholders adjoin the meter-house. Two of them are 180 feet in diameter, 100 feet high, and of 2½ million cubic feet capacity; and the third is a little smaller. The whole design is very simple.

THE PROPOSED PURCHASE OF THE KIRKBY LONSDALE GAS-WORKS BY THE URBAN DISTRICT COUNCIL.

A Special Meeting of the Kirkby Lonsdale Urban District Council was held on Monday last week, for the purpose of considering the draft agreement for the purchase of the gas-works. Mr. Punchard, who presided, said the agreement had been examined by the Gas Company; and the Chairman of the Company had also been present at the meeting of the Gas Committee of the Council. Each clause of the agreement had been carefully considered, and several alterations had been made. Mr. Picard had also suggested some verbal changes, which in the main had been agreed to by the Committee. Mr. Picard had further suggested that the Umpire to be appointed should be an experienced gas engineer. This, so far as he (the Chairman) could see, was what the Council desired; so there need be no difficulty on that score. Another suggestion was that coal, coke, tar, and other floating assets should not be considered when the works were valued, but should form a separate valuation when the Council took over the works, as they varied very much under circumstances which could not well be controlled. This was a reasonable suggestion, and need cause no friction. The question of the Council being responsible for their share of the insurance and other yearly payments was also reasonable. The Company wanted 5 per cent. interest for all money not paid at the time of purchase; but, after consideration, they agreed to take 4 per cent. They also did not want to be held responsible for any debts, &c., after the time of handing over the works. The last request was that the Company should be allowed to inspect the books, and have permission to make use of them for a reasonable time, for the purpose of satisfactorily winding up the Company. After some desultory discussion, the suggestions of the Gas Company were agreed to. In reply to an inquiry, the Chairman said if the purchase could not be effected before December, 1899, the Council would not be held bound by the present agreement; and the Council would take possession either on Jan. 1 or July 1 following the date of settlement. The formal resolutions authorizing the purchase of the works and plant at a price to be fixed by Arbitrators, approving of the draft agreement, and authorizing the Council's Solicitors to apply for the necessary Provisional Order, were then agreed to. A general discussion followed, as to the best method of appointing an Umpire in case the Arbitrators were not able to agree; but nothing definite was decided.

THE LEWES GAS COMPANY AND ELECTRIC LIGHTING.

As mentioned in the report of the proceedings at the half-yearly meeting of the Lewes Gas Company, which will be found under the heading of "Provincial Gas and Water Companies," the Company are considering the advisability of taking up electric lighting. The circumstances were explained by the Chairman (Mr. J. Broad) in the course of his remarks when moving the adoption of the report. He said that some time ago a meeting was held at the White Hart Hotel of those who were in favour of having electric light for Lewes; and on this occasion Mr. Walker gave an address on the advantages of lighting the town by electricity. The Directors considered the question, and thought it advisable at the time to take no further notice, but to wait and see the result. They had now their answer. Mr. Walker had given notice to the Town Council that he intended to apply for a Provisional Order for Lewes. On this coming to their notice, they again discussed the matter; and the Directors thought it prudent, in order to protect the property of the shareholders, to indemnify the Council against any cost if they would oppose the application, and apply for an Order themselves, on condition that they would hand it over to the Company—the Directors feeling they could do the thing more economically. A deputation waited upon the Town Clerk, and the matter had been brought before the corporate body, in whose hands the Directors had left a letter, the substance of which he had told them. They had now only to wait for the reply. He hoped the shareholders would think the Board had acted purely in their interest in what they had done.

One of the shareholders (Mr. Oke) remarked that there appeared to him to be a very considerable amount of risk in embarking on this kind of enterprise, without fully considering all the circumstances of the case. He believed he was right in saying that in Exeter only recently the Electric Light Company were glad to hand over their undertaking to the Corporation at a discount of 50 per cent. At Southampton, after working the electric light for a few years, the shareholders were glad to obtain only £11 10s. for a £10 share. Considering the risks, and the small dividend they paid, if any, it really seemed a question whether it was advisable to follow in their steps without first consulting the shareholders. No doubt those who placed their money in the Lewes Gas Company, and gave high prices for their shares a short time ago, little thought they were embarking on an undertaking which involved such uncertainties as the electric light. The light might be successful in large towns, and in small towns where there was a rich population; but was it probable that, in a steady-going place like Lewes, there would be a sufficient number of consumers to warrant the Company in taking the matter up? He was connected with a gas undertaking not more than fifty miles from there, about the size of that at Lewes, where the Directors were approached on this question; but, after careful consideration, they decided to have nothing to do with it. Though he believed the matter was not absolutely decided, he was given to understand that in all probability the result would be that the town would be lighted by the incandescent gas system, which, as they saw by the papers from time to time, was actually taking the place of the electric light, and had certainly thrown back the wave of the progress of that light. He was sorry to differ from the Directors, but it was a matter which essentially concerned the shareholders; and while thoroughly appreciating the efforts they were making as townsmen to do what they could for Lewes, he thought they must also remember the

shareholders as a body, and have the matter very closely put before them—not simply in a general way, but with figures to show them the advisability of undertaking this business. Then possibly, if they saw their way to entering into it, he should say no more on the matter. At present, he felt it his duty to his fellow-shareholders to protest against the proposal being pressed further without the consent of the general body.

It was pointed out by the Chairman that the Directors would not attempt to introduce electric light or to start, as it were, a fresh company without calling the shareholders together. All they had done at present was preliminary to what might take place hereafter. They had not committed themselves further than to indemnify the Corporation if they obtained a Provisional Order and handed it over to the Company.

Another shareholder (Mr. Miles, a member of the Town Council) said he was rather in accord with what Mr. Oke had said, but not because he wanted to prevent the electric light from coming into Lewes. What he feared was that the expenditure in the first place would amount to £300 or £400, with possibly a further loss every year all the time the light was in the town. Yarmouth was a large place; and one would have thought that if the electric light would have paid anywhere it would have paid there. But what did they find? According to the last report, they had lost no less than £1500 in two years; and in this particular instance the money had to come out of the pockets of the ratepayers. If this were so, and they took up the electric light in Lewes, the probability was that, whether it was taken up by a company or the town, there must be considerable loss. He did not see how it was possible to work it in Lewes and get any profit. Who was there in Lewes who would use the light? He had looked round and could see very few. He rather favoured the suggestion Mr. Oke had made with regard to the incandescent gas-light; and he thought it would be prudent of the Directors if they looked a little into this matter to see if they could not improve the light by the introduction of the new burners. He did not think it would be prudent for the Company to attempt to obtain the Provisional Order, neither did he think it would be so for the Council to do it on behalf of the town.

At the meeting of the Town Council on the previous day, the minutes presented by the Finance and General Purposes Committee contained a resolution recommending the Corporation to apply to the Board of Trade for a Provisional Order empowering them to supply electricity for illuminating and other purposes in the borough, and to call a special meeting to consider a motion on the subject to be proposed by the Chairman of the Committee. In moving the confirmation of the minutes, Mr. Gates remarked that the above resolution was one of some importance to members of the Council outside the Finance Committee who might not be aware of how the matter had arisen. Under the Electric Lighting Acts, a Provisional Order could be obtained by a private individual to supply electricity as a monopoly to an urban district; and Mr. Walker had given notice that he would apply for such an Order. The Committee had taken the matter into consideration, and felt it desirable that the monopoly should not be in the hands of a private person, but that if it was afterwards placed in the hands of a company to work it, the Council should have the Order, so that they might make such agreements and terms as they thought necessary with regard to lighting the town by electricity. It was provided in the Act that an Order should not be granted to a private company or individual unless the assent of the district council had been obtained; and they might think that if they did not give their sanction they would be safe. There was, however, a provision in the Act of 1888 by which the Board of Trade had power to dispense with the sanction of a local authority if they did not give a good reason for refusing their consent. The Finance Committee consequently thought they ought to give notice and obtain an Order; and this was the reason they had placed the resolution on the minutes. He could not tell exactly the cost of obtaining an Order, but it would be something like £300 or £400; and if they passed the resolution they must provide this sum for the purpose. Of course, if they thought electricity was not going to answer, they need not go farther. If they could not borrow the money and supply electricity themselves, they could make terms with a company; and this was the meaning of the resolution, which was brought forward to protect the interests of the ratepayers. The Committee were anxious that the ratepayers should have the monopoly, and not some private person or company. Mr. Hillman (a shareholder in the Gas Company) seconded the motion. The Mayor (Alderman Flint) remarked that, as the debate might affect some members of the Council who were shareholders in the Lewes Gas Company, he wished to state the following: "I am advised that shareholders in the Gas Company may not speak or vote; and I invite such members to declare themselves. They are not bound to do so; but if after such an intimation they speak or vote, they will do so clearly at their own peril." Mr. Savage thought they ought to go to the town before taking in hand a matter which would eventually cost £20,000 or £30,000. Mr. Gates pointed out that the question now under consideration was whether or not they should spend £300 or £400, and so prevent the possibility of a private individual or company getting the full control of the electric light in the town. The minutes were passed.

The Eight-Hour Day at the Blackburn Gas-Works.—The stokers employed at the Blackburn Gas-Works recently applied for an eight-hour day and a week's holiday with full pay each year. The Gas Committee have replied refusing to concede the week's holiday, but expressing themselves as favourable to the eight-hour day at the present rate of wages, provided each man carbonizes as much coal as he now does. The carbonizing arrangements are undergoing alteration; and when they are complete the Committee propose that the men shall work eight hours at 5s. per day, instead of 5s. 4d. as at present.

Harrow and Stanmore Gas Company.—At the half-yearly general meeting of this Company to-day, the Directors will report that the business continues to steadily increase. This has necessitated the erection of another gasholder, the contract for which has been placed with Messrs. Westwood and Wrights, who are proceeding with the work; the tank having been already completed by Messrs. John Aird and Sons. The accounts for the six months ending June 30 show receipts to the amount of £6991, and an expenditure of £4666; leaving £2325 to go to the profit and loss account. The balance on this account is £2367; and the Directors will recommend dividends at the rates of 7½, 7, 5½, and 6 per cent. per annum on the various stocks, less income-tax.

TOTTENHAM AND EDMONTON GAS COMPANY.

The Annual General Meeting of this Company was held at the offices, Willoughby Lane, Tottenham, on Saturday, the 28th ult.—Mr. Corbet Woodall in the chair.

The Secretary (Mr. J. Randall) having read the notice convening the meeting, the report of the Directors, with the accounts for the six months ending June 30, was presented. It was stated in the report that there had been an increase of 31,996,000 cubic feet, or 17·58 per cent., in the quantity of gas sold, as compared with the corresponding period of 1896; while the accounts showed an available balance of £8889, from which the Directors recommended a dividend at the rate of 12 per cent. per annum on the "A" stock, and of 9 per cent. per annum on the "B" and "C" stocks, less income-tax. These would absorb £8373, and leave £516 to be carried forward.

The Chairman, moving the adoption of the report, alluded in feeling terms to the late Chairman of the Company (Mr. G. Gripper). With regard to the work of the half year, the accounts showed that it had been of an unusually satisfactory character. A feature of great significance was the increased demand for gas. During the half year, they had sold 214 million cubic feet, compared with 182 million cubic feet in the corresponding half of the previous year. This was an increase in the past six months of 32 million cubic feet, or more than 17½ per cent. At this rate, if it were to continue, the business of the Company would double in about four years. He did not think the history of the undertaking showed a parallel to this growth; and he knew of barely another place where it had been equalled. The explanation of it was not to be found in any special direction, but was due to general expansion. The districts the Company supplied were rapidly filling up; and the low rate at which gas was now sold caused the consumption to increase in a greater ratio than the growth of the population. The use of gas by the poorer classes through prepayment meters was, he was happy to say, becoming established as a portion of the business; and it would evidently continue, and, they hoped, augment still further. It would interest the proprietors if he mentioned that at the end of the half year they had 6245 ordinary meters in use, as against 5764 in 1896—an increase of 481 or 12½ per cent. The prepayment meters had risen from 3390 to 4803—an increase of 1413, or 84 per cent. Of course, the percentage was necessarily large, because if one commenced with almost nothing, a small addition meant a large percentage; but these increases were very striking. The number of stoves was greater by 422, or 32 per cent. He thought these figures showed, as he had said, that the growth of the Company's business was not due to any one particular section of the undertaking, but rather to a general all-round increase in the demand. The business of supplying prepayment meters and the fittings attaching to them, was an important one to the Company, involving as it did, a large expenditure of capital. They had now nearly £25,000 invested in these meters and fittings in houses; and therefore it had been a matter of grave interest to the Directors. It was a great satisfaction to them to know now that the investment was not a risky, but a safe one. The number of houses in which they had fittings, but from which the meters had been taken out because of the removal of tenants and the failure of the incoming tenant to use gas, was only 60 out of 4800. Another matter for congratulation was the success that had attended the introduction of carburetted water gas. During the past half year, they had been supplying about equal quantities of coal and water gas, with the result that the quality of the gas had been improved, the cost had been reduced, and very general satisfaction had been afforded. One was almost weary of repeating that the residuals continued to be very low. There was no sign of an increase in the value of either of their principal secondary products. However, the Directors would try to do something to push forward the use of coke still further for domestic purposes. Turning to the financial result of the half year, he thought the proprietors would regard this also as satisfactory. The revenue account showed a profit balance of £8815, or £2455 more than the amount at this time last year; and out of this the Directors recommended an increase of ½ per cent. in the dividends. This increase was not resolved upon lightly; but they considered they were fully entitled to recommend it, as they had no fear as to being able to maintain it. The cost of the extra ½ per cent. would be about £300 per half year. The report referred to the imminent necessity of an application being made to Parliament for additional powers. The capital of the Company was pretty nearly exhausted, and with 17 per cent. increase, there was no prospect of shutting down their capital expenditure. It was not desirable to postpone the application until they were absolutely obliged to take what they could get; so that the probability was that it would be made in the coming session. There was one matter with regard to this application to which he made some reference at a previous meeting, and that was as to whether or not the Company should seek powers to undertake the supply of electricity. So far as the Directors were concerned, they were willing to do this for the district if they found themselves in accord with the Local Authorities. They had the opinion, however, that neither Tottenham nor Edmonton was a place where an electric lighting company would be likely to find business at a reasonable rate of charge sufficient to give them a profitable return on their capital. This was a matter, of course, that anybody would be able to consider for himself; but the Company had very distinct advantages as a lighting undertaking established in the district, which would enable them, the Directors believed, to supply electricity at a lower rate than anybody else. At the same time, the Company had fulfilled their duties as gas suppliers, because they had, he thought, won the approval of the Local Authorities; and if they found they could work in harmony with them, the Directors would be prepared, with the approval of the proprietors, to take up electric lighting. The only other matter that occurred to him to refer to was the selection the Directors had made of a successor to the late Mr. Gripper; and on this they felt they could congratulate themselves and the proprietors. Mr. Daniel Ford Goddard, M.P., was approached; and he agreed to fill the vacant place. He was brought up under his father, the Engineer of the Ipswich Gas-Works, for many years, and was afterwards himself Engineer of the Company. He had been Mayor of the town, and was now one of its representatives in Parliament. He retained a close association with the gas business, which would make him, the Directors believed, of considerable value to the Company.

Mr. Warren seconded the motion, and it was carried unanimously.

On the motion of the DEPUTY-CHAIRMAN (Sir H. Cartwright), seconded by Mr. H. BAILEY, the dividends recommended were declared.

The retiring Directors (Sir H. Cartwright and Mr. Bailey) and Auditor (Mr. A. H. Baynes) were then re-elected.

A vote of thanks was accorded to the Directors, Auditors, and officers of the Company; after which a vote of sympathy and condolence with the family of the late Mr. Gripper was unanimously passed.

The proceedings then closed.

PROVINCIAL GAS AND WATER COMPANIES.

Gas Companies.

The annual general meeting of the Cradley Heath Gas Company was held on Monday, the 30th ult.—Sir B. Hingley presiding. In their report, which was presented by the Secretary and Manager (Mr. C. Dakin), the Directors congratulated the shareholders upon the continued prosperity of the undertaking; the profit for the financial year ending June 30 being £2155. After providing for necessary renewals of plant, there was, with £401 brought forward, a total of £2556 available for distribution. The report was adopted, and the usual maximum dividends were declared. There has again been an increase in the quantity of gas sold as compared with last year, due in part to the general prosperity of the district, and also to the improved supply resulting from the laying of larger mains. To meet the increasing demand, it has become necessary to provide additional storage; and contracts have been entered into for the erection of a three-lift holder, 84 feet in diameter and about 80 feet in height, to hold 400,000 cubic feet of gas. The capital of the Company, authorized by their Special Act of 1871, having become exhausted, the Directors, in accordance with the resolution come to last year, applied to the Board of Trade for a Provisional Order to increase the capital and amend the Act of 1871. The Order, after considerable negotiation, was obtained.

The half-yearly meeting of the Derby Gas Company was held last Tuesday. The Chairman (Mr. H. Swingler, J.P., D.L.) presided, and said he had to announce that during the past half year the gas consumption had increased by 11¼ million cubic feet, which was the largest sale of gas by the Company as compared with any corresponding half year. He thought this was a very great source of gratification; but, of course, he had also to say a few words in regard to the reverse side of the picture as represented by the difficulties the Company had passed through during the last six months. They were difficulties which had never occurred before at their works, and which he was quite sure they would agree with him their staff had most satisfactorily dealt with. He need hardly remind the shareholders that, in addition to the anxiety they were caused by the strike, they suffered considerable loss. But at their last meeting they had reason to think some trouble was brewing; and he then made certain remarks with regard to new plant about to be erected at Litchurch which would be the means of saving labour. The strike, however, was not a challenge to that. Their men made certain demands; and the Directors were quite willing to listen to what they had to say. When they handed in their week's notices one Friday, the Directors naturally thought they were going to meet a reasonable body of men. Saturday and Sunday intervened before anything was done; and then the men insisted on keeping to their week's notice. Even on the seventh day of their notice, the Directors thought they would make a last effort to avert the strike, but without success. The consequence was arrangements had to be made to carry on the works. The result was known to those in the room; and he hoped the shareholders would agree with him in the course adopted, for they had now a grand body of men working amicably all round. With regard to the question of the cost, he was sorry to say that, roundly speaking, it had been nearly £3000. After all, they reaped their reward in the augmented consumption of gas. They had had an addition of 70 or 80 consumers; and by the same rule they had to show a satisfactory increase in automatic meters. They had now more than 700 in use, and working satisfactorily. The same state of things prevailed in regard to the gas-stoves for both cooking and heating. They had more than 1000 in use, while additional ones were being constantly applied for. He was pleased to say that they had made their contracts for coal at 1d. a ton less than their total contract for last year. The net result of the half-year's working had been that they had a balance of £16 more than was needed to pay their usual dividends, after, of course, they had accounted for an absolute loss of £3000. He moved the confirmation of the accounts. The motion was unanimously agreed to; as was a resolution that the usual dividends at the rates of 10, 7, and 5 per cent. on the various stocks respectively entitled thereto, be declared.

Mr. J. Kaye presided at the half-yearly meeting of the Douglas (Isle of Man) Gas Company, held on Monday last week. The Directors' report stated that the profit for the half year ending June 30 was £3571, which showed an increase upon that for the corresponding period of last year, notwithstanding the low price of residuals and the reduced price of gas. Including the amount brought forward from the previous account, the available balance was £5158. The Directors recommended the declaration of a dividend of 30s. per share, placing £500 to reserve, and carrying forward the balance. The Chairman stated that the increased profit was due, not to the growth of the town, but to greater use of gas for cooking purposes. The report was adopted.

In their seventh annual report, the Directors of the Falmouth Gas Company state that they are gratified at being able to present so favourable a record to the shareholders, notwithstanding the reduction of 6d. per 1000 cubic feet in the price of gas, making the present charge 3s. (*minus* the usual discounts), or less than is charged by any other gas company in Cornwall. The demand for gas steadily increases, in spite of the large number of incandescent lights fixed. It is a source of regret to the Directors that they have been unable to persuade the Town Council to adopt this system for the public lamps; its introduction in other places having proved successful. During the past year, considerable repairs to the mains, services, and meters were effected; a new steel foul main of improved construction was fixed; and a contract entered into for telescoping the large gasholder. These works were carried out under the supervision of the Company's Engineer (Mr. J. W. Buckley, Assoc.M.Inst.C.E.). The profit, as was anticipated from the reduction in price, is less than in the previous year. From it a dividend amounting to £843 was paid in February; and it is now proposed to pay one of £911, and to carry forward the balance.

The Directors of the Hartlepool Gas and Water Company, in the report presented to the shareholders at the annual meeting on the 31st ult., recommended dividends of 10, 7½, and 7 per cent. on the three classes of shares, free of income-tax, out of the balance of net revenue—£30,386, compared with £28,791 this time last year—leaving a sum of £2048 to be carried forward. In moving the adoption of the report, the Chairman (Mr. W. H. Fisher, J.P.) stated that the increase in the consumption of gas was about 9½ per cent. on the year; the total quantity being 336,681,000 cubic feet; and the increase of revenue was £3324, while the expenditure was £35,995. There was a considerable increase in the sale of gas, especially for cooking purposes; and the Directors had therefore decided on increasing the manufacturing plant. Though the Corporation of West Hartlepool were considering the question of lighting the town with electricity, he thought the Company had little cause for alarm, seeing that elsewhere its introduction had been accompanied by an increased demand for gas. The Directors had resolved upon lowering the price of gas, according to consumption, by allowing such additional discounts as would involve a sacrifice of £1200 per annum by the shareholders. The sale of water for domestic purposes had been 685 million gallons, against 664 millions in the previous year. The Directors were considering the question of increased water storage. In answer to a question, the Chairman said that 6,553,800 cubic feet of gas had been supplied by "slot" meters since their introduction. The report was adopted.

The accounts of the Lewes Gas Company for the six months ending June 30, which were presented at the half-yearly general meeting last Thursday, showed a balance of £1466 on the revenue account. The sum available for distribution was £2065; and the Directors in their report recommended dividends at the rates of 10 and 7 per cent. These, after deduction of income-tax, would amount to £1384; leaving a balance of £681 to be carried forward. In moving the adoption of the report, the Chairman (Mr. J. Broad) expressed the pleasure of the Directors at being able to put before the shareholders so satisfactory a statement of accounts with a progressive business. He said he was somewhat astonished to find that they had increased their sale of gas by something like 1¼ million cubic feet, as compared with the corresponding half of 1896. He well remembered when Mr. Paddon, their Engineer, was there, and they were building the new gasholder, he said they would require to increase their sale by something like 5 per cent. The increase of 1¼ millions, however, represented an increase of 7½ per cent., which showed a very successful trade. He was somewhat interested to know how this was disposed of; and he was glad to find that the ordinary meter passed 3¾ per cent. of it, while the slot-meters, which were generally used by mechanics and artizans, accounted for an increase of the other 3¾ per cent. The use of these slot-meters was gradually extending, and the system looked like producing a good revenue in the future. They had furnished a much better light and better gas altogether, which had been done by using a considerable quantity of cannel coal. It was, of course, more expensive; but this was not a consideration equal to the satisfaction they gave to consumers of the gas. Moreover, it was not all loss, because something came back to them in the way of residuals; and he was pleased to state that the receipts for these had increased by £170 or £180. They had been supplying gas of 16 instead of 14 candle power; and he did not remember passing through any previous six months in so satisfactory a manner, having regard to the absence of complaints. The buildings and all the plant appertaining to the Company (under the supervision of Mr. Levi Monk, the Manager) were in first-class condition. Reverting to the accounts, he remarked that a small balance would be carried forward. The Directors thought this was right, as the Company was pretty heavily laden. They started within seven years of the introduction of gas in London; showing that they were one of the pioneers of gas in the country. This being the case, they had a rather heavy capital, because it was not like starting at the present day. If they had to erect works now, they could do so at very much less cost. Therefore they were obliged to earn more money, and they had less to play with. The Chairman then went on to refer to a proposal before the Town Council that the Company should take up electric lighting. This matter is dealt with, in connection with the proceedings of that body on the previous day, in another part of the "JOURNAL." The report was adopted, and the dividends recommended were declared. A vote of thanks was accorded to Mr. Monk for the interest he took in the success of the Company.

At the half-yearly meeting of the Lynn Gas Company on Tuesday, an interim dividend at the rate of 10 per cent. per annum was declared; and a resolution was passed authorizing the Directors to apply for a Provisional Order to enable them to raise additional capital to an amount not exceeding £15,000 (including £7000 already sanctioned), for erecting a gasholder, a purifier, and other plant.

The half-yearly meeting of the Portsea Island Gas Company took place on Saturday, the 28th ult.—Sir W. D. King, J.P., presiding, in the absence of Sir John Baker, M.P., the Chairman of the Company. The accounts presented showed that the total revenue in the six months was £52,058, and the expenditure £39,937; leaving £12,121 to be carried to the profit and loss account. The Directors recommended the payment of dividends at the rates of 13, 12, and 5 per cent. per annum on the three classes of stock. This was agreed to.

The present is the Jubilee Year of the Richmond (Surrey) Gas Company; and at the meeting of shareholders on the 26th ult., the Chairman (Mr. J. Carless) alluded to the fact, and expressed his gratification that the fifty years' existence of the undertaking had been a record of progress and success. Coming to the working in the six months ending June 30, he remarked that in the corresponding half of 1896 the Directors had a rather unfavourable balance-sheet to bring forward. It arose from a smaller quantity of gas sold, the low price obtained for the residuals, and heavy expenditure in alterations; so that the earnings did not allow them to pay the usual dividends without taking from their undivided profits upwards of £1500. In consequence of this, they had increased the price of gas to 3s. They had now the pleasure of presenting a balance-sheet showing a better state of affairs; and though the price of residuals was still low, the dividend had just been earned. Turning to the accounts, he stated that the expenditure for coals was £600 more than in the corresponding half year, due to the fact that the Company had had a very considerable increase in the demand for their staple product, necessitating the carbonization of upwards of 1000 tons more coal.

Purification and wages showed increases corresponding to the larger production; while repairs and maintenance came to about the usual amount—a liberal expenditure having been allowed to keep the plant in excellent condition. With regard to public lighting and the rental of meters and stoves, there was a fair increase. Stove-rents continued to grow, and gas for cooking purposes seemed to become more popular than ever. They had now more than 800 stoves in use with "penny-in-the-slot" meters; and orders for installations of this system in the smaller houses were still coming in. The residual profits showed an increase of £580. On the profit and loss account there was a balance of £6586, which would allow of the payment of the usual dividends; but the amount to be carried forward was somewhat below that of twelve months ago. Mr. T. M. Clarke seconded the motion; and it was carried unanimously. The Chairman then moved that the following dividends be declared for the past half year: 5 per cent. on the "A" and "B" stock, making 10 per cent. for the year; and 3½ per cent. on the "C" stock, making 7 per cent. for the year. This was also agreed to. Votes of thanks were then accorded to the Directors, as well as to the Engineer and Secretary (Mr. T. May, jun., Assoc.M.Inst.C.E.), for the satisfactory way in which they had conducted the business of the Company.

The half-yearly general meeting of the Sevenoaks Gas Company was held on the 26th ult.—Mr. W. Hughes presiding. The Secretary (Mr. H. How) read the report of the Directors, which set forth that the revenue in the six months ending June 30 amounted to £5903, and the expenditure to £3948; showing a profit balance of £1955. The amount available for distribution was £3626; and the Directors recommended dividends at the rates of 10 and 7 per cent. per annum, less income-tax. More capital has been called up, to meet the increasing demand for gas cooking-stoves, automatic prepayment meters, and fittings—a branch of the Company's business which is rapidly increasing. Three exhibitions were held in the past half year, the effect of which has been to stimulate the use of gas for domestic purposes. The Manager (Mr. W. J. Dougall) reported that the manufacturing plant had been maintained in good working condition; and that considerable attention had been given to the mains and services. In moving the adoption of the Directors' report, the Chairman remarked that he thought the shareholders would see that the undertaking was in a satisfactory state. They were, in fact, making good progress; for they were extending the distribution of gas by supplying it through slot-meters and cookers. The Directors trusted not only that this class of consumers would steadily increase, but that there would be an increase in the consumption of gas generally. Since the last meeting they had completed the erection of the new gasholder, by which they hoped to save a good deal of waste, or unaccounted-for gas, in addition to enlarging their storage capacity. The report was adopted; and the dividends recommended were declared. The Chairman proposed a vote of thanks to the Secretary and Manager for their attention to the Company's business; and it was carried unanimously.

The half-yearly meeting of the Waltham Abbey and Cheshunt Gas Company was held on the 27th ult., under the presidency of Mr. Corbet Woodall, M.Inst.C.E. In moving the adoption of the report, the chief features in which were noticed in the "Journal" a fortnight ago, he said it was altogether of a satisfactory character. Though the undertaking had been for many years either stagnant or going backwards, now it was making phenomenal progress; the works having been doubled in about 5½ years. He did not expect such a rate of progress would continue. It was due chiefly to prepayment meters and gas cooking-stoves; and the time must come when most of the people who wanted stoves would be supplied. The revenue from gas, which this time last year was £2890, now amounted to £3224. During the past six months the Company had fully earned the dividends recommended. Comparisons might be "odious;" but he must remark that the results achieved had not been reached by many companies equally as well placed as the Waltham Abbey and Cheshunt Company. Mr. Alfred Kitt, Assoc.M.Inst.C.E., seconded the motion; and it was carried unanimously. Dividends at the rates of 7 and 5 per cent. per annum were afterwards declared.

We noticed in the "Journal" for the 24th ult. the report of the Directors of the Weymouth Gas Company. In moving its adoption at the recent half-yearly meeting, the Chairman (Mr. R. Thomas) referred to the application made by the Company to Parliament last session, and congratulated the shareholders upon its successful result. It had been asserted, he said, that the Company had only gained a hollow victory; but they had, on the contrary, succeeded in getting a very substantial Act, whereby they had obtained some important concessions. The Bill was drawn so liberally for the benefit of the consumers, that the Directors never expected it would encounter opposition. But it did; and the result was that instead of their expenses being about £500 or £600, they would be at least £1000 extra. He did not know what the costs of the town would be. He saw the Mayor and several members of the Corporation, and suggested that if there was any fault to be found with the Bill a conference should take place. If this had been done, the affair could have been settled in five minutes without 5s. expense. The Corporation would not, however, venture upon such a course as that. Passing on to the working of the undertaking in the period covered by the report, he said there had been a gradual progress in the consumption of gas throughout the town. The prepayment system had been introduced, and was found to answer satisfactorily. The report was adopted, and dividends at the rates of 10 and 7 per cent. per annum were declared for the half year. A resolution was passed reducing the number of Directors to seven; and the proceedings closed with votes of thanks to the Chairman and Directors, the Engineer and Secretary, and the staff—Mr. J. Lowe briefly acknowledging the latter compliment.

At the meeting of the Winchester Water and Gas Company on the 24th ult., the accounts presented showed receipts to the amount of £9970, and an expenditure of £5982 in the six months ending June 30; leaving a balance of £3988. The Directors recommended dividends at the rates of 10 and 7 per cent. per annum for the half year; and this was agreed to. In the course of his address to the shareholders, the Chairman (Mr. W. Barrow Simonds) alluded to the difficulty which has arisen between the Company and the Corporation in regard to the laying of a pipe for the supply of oil to the gas-works, to which reference has already been made in the "Journal." He stated that the Company had been landed in a law-suit with the Corporation. The proprietors were aware that many months ago a main was put down from the railway to supply the works with oil for the manufacture of carburetted water gas. The oil had been running for at least eight months, and he was not aware that it had caused any trouble to the town, or nuisance in any shape or form. However, the Corporation had thought it was their duty to take proceedings to endeavour to stop the Company from using the main for the purpose intended. They seemed to think the Company had no right to put a pipe down to carry oil for the purposes of their work; but the Directors, who had looked into their Act of Parliament and had obtained very high legal advice in the matter, believed they were justified in the step they had taken, and were possessed of full powers to do as they had done. It was all the same a knotty legal point, which would unfortunately have to be solved by the Court. If the action fell through, it would cost a great deal of money both to the citizens and the Company, who were about the largest ratepayers, paying something like £1500 a year; and whichever way the case went the Company would have to bear a considerable proportion of the expense. However, the Directors felt it was their duty to protect what was the proper right of the Company, and they had taken the necessary steps to do so. Supposing for a moment the Corporation succeeded, and were able to stop the Company bringing oil down in the way they were doing by pipe, what then? He presumed the Corporation could not possibly get an injunction to prevent them from conveying the oil to the works by carts. He imagined the Company had the right to use the roads, the same as the rest of the public, towards the maintenance of which they paid largely; and the consequence would be that, instead of the oil passing in by the pipes in the ordinary way, without trouble or difficulty to anyone, it would have to be brought to the works, to the annoyance of people, to the wear and tear of the roads, and at an increased cost for manufacturing gas. If the Company were not allowed to make use of the various improvements and appliances, as they appeared to them, for making gas, it was clear that they could not reduce the charge for it. But the Directors had a strong belief—and he personally had very strong faith—that the Court would not see the matter in the same light as the Corporation did, and that the Company would be justified in the work they had done. A resolution approving of the action of the Directors in taking the necessary steps to defend their position in this matter, and empowering them to institute such other proceedings as might become necessary, was therefore passed unanimously.

The report of the Directors of the Wolverhampton Gas Company for the half year ending June 30 was duly noticed in the "Journal" last week. In moving its adoption at the meeting of shareholders held on Tuesday, the Chairman (Mr. H. Ward) remarked that, though the period lately closed was the less profitable portion of the financial year, they had before them, nevertheless, the gratifying fact that the consumption of gas had greatly increased; the total being larger than had ever been previously attained. This was attributed to the long-continued cold, dull, and foggy weather of the spring. The increase amounted to 17½ per cent., and was represented by a sum of £5104. They had also received £700 more for coke and other residuals. But against these amounts they had to set a rise of £2154 in the cost of coal, and a very large addition to the working expenses, which amounted to £1050 more than the ordinary figure. So serious had the question become, that in laying down new plant the Directors had adopted those of the most recent improvements which effected a saving of labour. In this way they hoped to reduce their working charges. The cost of repairs and maintenance had gone up by £1300; making a total increase of £4000 in the expenditure. The Directors would have been glad to offer a reduction in the price of gas; but they had to consider the interests of the shareholders as well as those of the public, and they found that the present was not an occasion on which it would be advisable to give any concession. Among other reasons was the fact that their contracts for the purchase of next year's coal were entered into at an advanced price of 4d. per ton; making a total difference of nearly £1000. Moreover, the price of residuals would doubtless go down farther. In addition to improving the plant, they had erected a new gasholder with a capacity of 1¼ million cubic feet. They had also started an insurance fund, which now amounted to £1000. The motion was carried. Dividends were then declared for the half year at the following rates: 3 per cent. on the preference stock, 5¼ per cent. on the consolidated stock, and 3¼ per cent. on the new ordinary stock (less income-tax). Votes of thanks having been accorded to the Chairman and Directors, the Engineer (Mr. J. Annan), Secretary (Mr. A. Jones), and staff, Mr. Annan, in acknowledging the latter, remarked that for the last thirty years the shareholders had never been without a dividend of 10 per cent. This spoke well for the past directorate; and for the present Directors, he could say that they were as good as their predecessors—being anxious both that the gas should be of proper quality and that the price should be low. He was afraid that the heaviness of the working expenses and the serious liabilities they might incur under the new Compensation to Workmen Act would make it impossible to reduce the price of gas just now.

Water Companies.

Presiding at the half-yearly meeting of the Barnstaple Water Company yesterday week, Mr. E. Dennis congratulated the shareholders on the completion of the last section of the 18-inch main. This finished the scheme of the late Mr. Thomas Hawksley; and though the three sections had taken some time to lay, the 18-inch main was now complete from the intake at Snapper to the filter-beds at Raleigh reservoir—a distance of about 2½ miles. The report of the Directors showed that there was a disposable balance of £1294 on revenue account; and it was decided to pay the statutory dividends, and carry forward the balance, £423.

The ordinary general meeting of the Leatherhead and District Water Company was held on Tuesday—Mr. H. Rokeby Price presiding. In moving the adoption of the report, he remarked that the capital expenditure for the past half year amounted to £3982, against only £1745 for the whole of the previous five years. This heavy increase was accounted for by the large amount of work carried out. The new reservoir was nearly completed, and would shortly be in use; and from this and the considerable additions made to the trunk mains, great improvement in the supply to the outlying districts was confidently anticipated. For the period under review, the receipts were £1587, and the working expenses £932; leaving a profit of £655, or £144 in excess of that for the corresponding period of 1896. To this there remained to be added the £545 brought forward; making a total of £1202. Deducting £142 required to pay the interest on the debenture stock, there was left £1057 available for distribution, out of which the Directors recommended the payment of

a dividend at the rate of 3½ per cent. per annum. The report was adopted.

The half-yearly report and accounts of the Maidstone Water Company show that the water-rents amounted to £4850, and the balance standing at the credit of the profit and loss account was £6109. At the ordinary general meeting on the 26th ult., it was resolved to pay dividends at the rate of 9½ per cent. per annum on the 10 per cent. shares, and of 6½ per cent. per annum on the 7 per cent. shares. These payments will absorb £2075. The Company have resolved to raise an additional £5000, part of the £12,000 sanctioned by the Maidstone Water Order, 1896.

At the ordinary general meeting of the Woking Water and Gas Company on Tuesday, Mr. Charles Horsley, who presided, stated that the Directors were doing their utmost to consolidate the business; and they had made arrangements for themselves undertaking, in the future, the pumping operations. During the past half year, there had been a satisfactory increase in the number of services supplied; and he was pleased to say that the Company continued to make encouraging progress. The revenue for the period under review was £3596, and the expenses were £1420; thus leaving a net balance of £2176. The Directors recommended the payment of an interim dividend at the rate of 4 per cent. per annum for the half year, leaving £445 to be carried forward. He concluded by moving the adoption of the report, which was noticed in the "JOURNAL" a fortnight ago. Mr. R. Hesketh Jones, seconding the motion, referred to the question of increasing the water supply of the Company, and said they were negotiating with Lord Onslow, as Lord of the Manor, for the right to sink additional wells on his property. After a short discussion, the report was adopted.

LEEDS CORPORATION AND ELECTRIC LIGHTING.

The Proposed Purchase of the Yorkshire House-to-House Company's Undertaking.

At the Meeting of the Leeds City Council last Wednesday—the MAYOR (Sir J. Kitson, M.P.) in the chair—the following motion came up for consideration: "That the Council, as the local authority under the Electric Lighting Orders Confirmation (No. 12) Act, 1891, give notice in writing forthwith, in pursuance of section 59 of the last-mentioned Act, to the Yorkshire House-to-House Electricity Company, Limited, being the undertakers within the meaning of the said Act, requiring them to sell their undertaking to the Council."

Mr. FORD, in moving the resolution, explained the circumstances under which, after having spent £12,500 in experiments on electric lighting at the Town Hall, the Corporation decided not to undertake the lighting of the town, but, in 1891, consented to a Provisional Order being promoted by the Yorkshire House-to-House Electricity Company, which Order was ultimately confirmed. According to the 59th section, the Council might, at any time within 42 years, give notice to the Company requiring them to sell the undertaking; the terms being that the Council must transfer to the Company such an amount of Leeds Corporation stock as would produce, by interest or dividends thereon, an annuity of 5 per cent. on the sum properly expended on the undertaking, and chargeable to capital account. Further, if the undertaking was purchased within ten years of the date of the Order (which was granted on July 3, 1891), it was stipulated that if the Company had failed to get a dividend of 5 per cent. per annum on their capital outlay, the Corporation had to make up the aggregate dividend of 5 per cent. per annum; but if in any year they paid more than 5 per cent., the amount in excess was to go towards wiping off the deficiency of other years. The terms varied for the acquisition of the concern after the expiration of 21 and 31 years. The Company made their first issue of capital in 1892; and so rapidly had the business extended that in February last a resolution was passed to increase the capital from £100,000 to £200,000. The £5 shares were now quoted at, roughly, $8\frac{3}{16}$; and he believed some of the new shares, on which only 30s. had been paid, were on the previous day sold in the market at more than £4. Up to Dec. 31, 1892, the capital expenditure was £18,993; to December, 1893, £42,154; to December, 1894, £64,118; to December, 1895, £76,526; and to December, 1896, £105,377. He ventured to say that the increase in 1897 would probably be greater than that of last year. By paying the Company Corporation stock which would yield 5 per cent. per annum on the capital expenditure, they would pay them—if the Corporation stock was worth par—practically £2 for every £1 they had expended on capital. He now came to the question of the revenue of the Company. In 1893 it was £3771; in 1894, £7245; in 1895, £11,273; and in 1896, £14,728. If they took the profits, the interest paid on loans (which would rank as profits if the undertaking were in the hands of the Corporation), and also the amount written off for preliminary expenses, it would work out as follows: For 1892, £131; for 1893, £1383; for 1894, £3756; for 1895, £5501; and for 1896, £7486. These figures were arrived at after writing off £1300 and £3000 in 1895 and 1896 respectively for depreciation. The Council would probably like an approximate estimate of the income in the latest complete year of the Company's trading. To the profit of £7486 for 1896 they might add £500 for Directors' fees (which would not be paid if the concern were acquired by the Corporation); making the total £7986, or, approximately, £8000 per annum. He had already mentioned that the Corporation on acquiring the concern would have to make up the deficiency on a 5 per cent. dividend in any year of the Company's working. In 1894 they paid 4 per cent.; in 1895, 5 per cent.; and in 1896, 6 per cent.; and if they went on at this rate of progress it might be expected that a still better return would be yielded. The return averaged over these three years had been 5 per cent.; so that up to now the Corporation would only have to provide 5 per cent. upon the capital dealt with in 1892 and 1893. The capital in 1892 was only £19,000, 5 per cent. on which represented £950; and in 1893 it was £40,000, which at 5 per cent. would come to £2000. Therefore in all it only worked out to a liability of about £3000. Other Municipalities had been wiser than Leeds in retaining the electric lighting concession in their own hands. Bradford was a notable instance. There the undertaking had been an unqualified success, although the current was supplied at the comparatively low rate of 5d. per unit. A more striking example was afforded by Manchester, which had expended £309,190, and the profit for the year ending March, 1897, was £16,812. Some 46 towns had the electric lighting in their own hands; and, almost without exception, they had yielded a surplus for the year, and some of them a handsome one. It did not follow that because they had succeeded, a Corporation which had to acquire a concern from a private Company would also succeed. But he would quote a case in point. Liverpool in 1896 awoke to the fact that it had made a mistake in parting with its concession; and the Corporation gave notice to the Electric Lighting Company that it would acquire the undertaking. The capital outlay of the Company was £264,000; and the price paid by the Corporation was £400,000. They took over the undertaking in July, 1896, and for the half year ending December there was a profit of £21,908, which was only £1465 less than that for the whole of 1895 under the Company. After providing for interest on the £400,000, and setting aside a sum for the reduction of the debt, there was a surplus for the half year of £11,376. Assuming that the profit for the first six months of the present year had been the same, this yielded a profit of 9½ per cent. on the capital expenditure of £400,000. This case would not nearly correspond with that of Leeds. Sheffield also allowed the electric lighting to pass into the hands of a Company, whose capital outlay was £87,000. Up to the end of last year the revenue was £12,477, and the dividend paid was 7½ per cent. The Sheffield Corporation in April last gave notice that they would acquire the undertaking. Reverting to the case of Leeds, the speaker said it was desirable that the Corporation should step in at once, before the capital expenditure of the Company became any greater, and acquire the undertaking for the benefit of the citizens. Some might ask what were likely to be the financial results of the undertaking. The profits for last year, as he had shown, were £7486. Assuming that the Company had increased their capital to the extent of £50,000, as he presumed they would this year, and that the earnings were in the same ratio, there would be a profit of £3743 on the extra capital; making a total of £11,229. Last year the Company allowed £3000 for depreciation. If the Corporation provided a sinking fund to redeem their debt in thirty years, it would not be necessary to depreciate so heavily. This would bring up the disposable profit to £14,229.

Mr. LAYCOCK seconded the motion.

Mr. CLARKE, in view of the importance of the subject, moved, as an amendment, that the whole matter be referred to the Parliamentary Committee for inquiry and report, and that the Committee, for this purpose, have power to add to their number. He said the question was one as to which full inquiry was absolutely necessary. Judging from the figures adduced, it appeared likely that the expenditure involved might be anything between £350,000 and £500,000; and there would have to be considered the questions of how far the expenditure which had been made was capital expenditure, what facilities the Company had for further production, and what was the amount of light they supplied at present.

Alderman GORDON seconded the amendment. He said he should like the Corporation to understand that in taking over the electric lighting business they would be acquiring a thing which was not in any sense a common want of the citizens, but rather a luxury which many members of the Corporation even did not indulge in. He must congratulate Mr. Ford, therefore, upon plunging boldly into a big increase of the debt of the Corporation; because the possible increase of their liabilities was one of the things which shocked that gentleman and those who were associated with him so much when it was undertaken in the case of things that were really necessities for the inhabitants of the city. This question was one which should only be decided after ample inquiry.

[At this point, to the amusement of the Corporation, the electric lights in the Council Chamber suddenly dwindled to about half their normal brilliancy. Amid the laughter which the incident evoked, it was impossible for Alderman Gordon to proceed with his remarks; and he was compelled to pause until order was restored and the "temporary eclipse," as a local paper called it, came to an end.]

Alderman GORDON, resuming, said Mr. Ford had cited the case of Bradford. There was the danger, when one rushed into comparisons of this character, that there might be weaknesses behind which rendered the comparison useless. As a matter of fact, Bradford ought not to be compared with Leeds, because its method of generating and supplying its current was altogether different. It dealt with a very small selected area, and by a continuous, not an alternating current. Bradford, too, had come pretty well towards the end of its possibilities; and if it intended to extend its system, it would have to adopt some new arrangement. On the other hand, Mr. Ford took the case of Liverpool, and gave only the profit which that town had had at its disposal. One ought, however, to ascertain at the same time what was charged for electricity; and he (Alderman Gordon) found that it was 6·34d. per unit on the average, while Leeds, under a Company who endeavoured to make a profit, was only charged 4·8d. per unit. [Mr. FORD: What about Manchester?] Manchester, again, was a different case, because it had a selected area. The point that arose in his mind was this—that, so far as the figures showed, it was perfectly clear that there was no "catch" for the city in making the purchase. If the Corporation bought the undertaking on the lines of giving £2 worth of their 2½ per cent. stock for every £1 which the Company had spent, they would lose money. Or they might purchase on the lines that the Company made a profit of, roughly speaking, £8000 last year, and create capital by issuing 5 per cent. instead of 2½ per cent. stock. If they took 5 per cent. on £120,000, it would be about their figure; and with the £2 5s. 6d. that must be set apart for redemption, it would practically double up the whole £8000 the Company legitimately made last year. So that at present there was no great "catch" in this purchase for the Corporation. On the other hand, if the matter were looked at from the consumers' point of view, it would be found that only six Municipalities supplied light to their customers at a lower rate than the Leeds Company did; and their prices were only fractions of a penny less. So that, again, there was no great "catch" for the consumer in the purchase of this undertaking. But there was the other and greater question of the future. It was clear that the electric light had passed its experimental stage, and that it was going to grow tremendously in popular favour. It was the duty of the Corporation, therefore, to see whether, though at present it would be no great advantage to acquire the undertaking, the prospects of the service were not so good as to make it extremely desirable for them to do so. One reason for not adopting Mr. Ford's resolution at this meeting was that it was by no means clear whether or not the Corporation would have to give the Company the equivalent of a perpetual annuity in purchasing. It was

by no means clear that the Company would accept any of the stocks the Corporation had power to issue. He understood that the Sheffield Corporation had given the local Company notice, just as Mr. Ford proposed to do here, and that the reply was that it was useless for them to do so, because the Corporation could not give them what the Act specified that they should have—viz., an annuity, which they interpreted to be a perpetual annuity, equal to 5 per cent. on their outlay. If he was informed rightly, they were actually going to law on this question; and the Sheffield Corporation were seeking to have the law interpreted that it was sufficient to give stock that now produced 5 per cent., without dealing with the "perpetual" question. Until the Courts had decided this point, no real step could be taken as to the acquisition of the concern. At the same time, if the decision should be against the Sheffield Corporation, and the Company would not abate their demand, it would be necessary for Sheffield, as it might be for Leeds, to go to Parliament to obtain power to create the class of stock insisted upon. He should hope, however, that, if Leeds decided to purchase, and they were not able to give the Company what they believed they were actually entitled to, they might be able to make with their fellow-citizens a bargain which would give them the equivalent of what they wanted without being put to the expense and delay of approaching Parliament.

Mr. Ford, alluding to Alderman Gordon's remarks, said he did not object to heavy expenditure if it was of a perfectly legitimate character and in the interests of the citizens. Alderman Gordon had given the best reason for the purchase of the undertaking—viz., that electricity was the light of the future, and was bound to grow tremendously. He (Mr. Ford) had based his remarks on these two theories, and not so much on the fact that the proposed purchase would be a great "catch." He was quite willing to accept the amendment.

The amendment, on being put to the vote, was carried unanimously.

GAS, WATER, AND ELECTRICITY SUPPLIES AT ST. HELENS.

Local Government Board Inquiry.

Last Thursday, on behalf of the Local Government Board, Colonel W. Langton Coke, M.Inst.C.E., held an inquiry into an application by the Corporation to borrow £67,328, for necessary extensions and alterations of property in their hands on behalf of the ratepayers. One of the most important items on the list was £25,000 for gas-works purposes, which included the extension of the works which was decided on some few months ago—viz., the reconstruction of two of the present gasholders, an extension of the retort-house, new condenser, and exhauster with engine, and new distributing mains. A further sum of £17,000 is required for the extension of the electricity works and the laying down of additional plant for the production of electric light. A sum of £20,328 was also wanted for the water-works, to provide for the erection of a new pumping-station and works on the site already acquired at Melling, near Ormskirk, at an estimated cost of £17,528, and the laying of another 21-inch main from Portico to Brown Edge, at an estimated cost of £2800. The various items were explained to the Inspector by the Town Clerk (Mr. W. J. Jeeves), and further elucidated by the officers of the Corporation—Mr. Samuel Glover (Gas Engineer), Mr. Robert Hammond, of London (Consulting Electrical Engineer to the Corporation), and Mr. J. J. Lachland (Water Engineer).

As to the proposed gas-works loan, the Town Clerk explained that the gas undertaking of the Corporation had been one of uninterrupted prosperity from the time they acquired it in 1878. At that time the works had a capacity of 800,000 cubic feet, whereas to-day the capacity was 1,250,000 cubic feet. Two years after 1878, the total manufacture was 111,800,600 cubic feet; whereas during the year ended March last it was 256,022,600 cubic feet. In other words, to-day they had a capacity of more than half as much again, and a consumption which was two-and-a-half times as much again. In connection with the works they had borrowed £44,182; and, in addition, they had spent £22,370, which might have been charged to capital account. The result was they had a much more valuable undertaking; while the debt was only £18,000 more than when the works were purchased. Further than that, the price of gas was reduced from 4s. per 1000 cubic feet absolutely to 2s. 6d. with a discount, which meant a net average price of 2s. 3d. Without increasing the debt, they had, roughly speaking, doubled the works, more than doubled the consumption, and nearly halved the price. The Town Clerk went on to state that on one day last December 1,352,000 cubic feet more gas than they could manufacture was consumed. The works, in fact, were pushed to their utmost limit; and the increased expenditure was most necessary. Councillor Foote asked if the introduction of electricity had not interfered with the consumption of gas. The Town Clerk said, on the contrary, it had gone on increasing; and the increase was apparently due to the fact that gas undertakers were everywhere making a greater effort in the way of supplying heating and cooking stoves, which counterbalanced what might otherwise be lost through the introduction of the electric light in the town.

With reference to the electric light, the Town Clerk said they proposed to put down another set of plant and apparatus; so that if they found the demand for electricity continued to increase, they would have a large plant for a second duplication. It would also, in that event, be a great economy for the future.

The loan for the Melling water scheme was subsequently introduced by the Town Clerk, who said that in 1893 Major Crozier held an inquiry into an application for a Provisional Order which was required to provide a further water supply; and in 1894 the Order was granted. The reason why no application had been made under the Order was that at the end of 1895 there was a great coal strike, and St. Helens trade was very much affected; the result being that the increase in the demand for water which the Corporation had expected was not realized. During the last year or two, however, the demand for water had greatly increased. At present the total amount of water which they could supply was 3,400,000 gallons, while the average consumption was 3,000,000 gallons. In the hot season, however (in the months of July and August last year particularly), the average supply per day was 3,300,000 gallons. They had only storage accommodation for two days' supply, which was running matters very fine, and in hot weather they ought to have a good reserve. As a matter of fact, on one day 3,950,000 gallons were consumed. It was important that a manufacturing borough like St. Helens should not fail in respect of its water supply; and it was felt that steps ought to be taken for meeting any probable demands upon their resources. The proposed expenditure of £20,228 included £2500 for sinking a well at Melling, £4500 for engines, boilers, and pumps, £4400 for an engine-house, boiler-house, &c., £600 for engineers' cottages, and £5428 for mains from Melling to Kirkby, &c. The Town Clerk also asked for sanction to borrow £800 for the erection of two houses at the Kirkby pumping-station, for the convenience of the workmen employed there.

THE PRICE OF GAS AND THE GENERAL DISTRICT RATE AT TEIGNMOUTH.

Last Tuesday the Teignmouth District Council once more discussed the policy (?) of increasing the general district rate to aid the deficiency in gas-works revenue. The Chairman of the Finance Committee (Mr. Wheatley) produced the estimate of the new district rate, showing the total estimated expenditure to be £3199 10s., and leaving £2573 10s. to be provided. It was thought that 1s. 9d. in the pound would be sufficient to raise this amount. Mr. Wheatley said this was 1d. in the pound less than the last rate, and 2d. less than the corresponding rate of last year. There was a large deficit on the gas account; and the Committee had decided to wipe it out by drawing on the general rate. They could, of course, have increased the price of gas; but everybody objected to that. Consequently the Committee suggested that for two years an increase should be made in the amount payable for public lighting, of £200 each half year; and also that £300 be transferred from the district rate to the gas account. Mr. Jarvis: You are putting all this on the district rate? Mr. Wheatley: We have to meet the difficulty somehow; and the question is how to do it with the least friction. Mr. Jarvis: I shall strongly object. Why should persons who do not use gas have to help to clear off the debt? Mr. Sercombe also objected to the arrangement. Those who consumed gas should, he said, pay; and he suggested adding 2d. per 1000 cubic feet to the price of gas. Mr. England called the proposal "trickery." Mr. Jarvis moved as an amendment, and Mr. England seconded, that only £100 extra be paid half yearly for public lighting; but this was defeated, and the estimate was approved.

CARLISLE CORPORATION GAS AND WATER SUPPLY.

The Annual Accounts.

The accounts of the Gas and Water Committee of the Carlisle Corporation for the financial year ending June 30 have been issued; and we take therefrom the following particulars:—

At the commencement of the year, there was an outstanding loan account of £28,592, raised at 3 and 3½ per cent., out of the original £43,000. In the past twelve months, £2459 was paid off; so that £26,133 remained. The amount expended on fixed plant to June 30, 1896, was £118,739. During the year, this sum was increased by £665 in respect of new mains and service pipes, including laying and paving; and there was spent on meters £1143. The gas revenue account shows that a sum of £24,240 was expended in the manufacture of gas, £16,230 being for coals; distribution cost £1907; salaries and wages, £3826; and repair and maintenance of works and plant, £3737—the total outlay being £29,174. The sale of gas produced £30,435, of which £27,233 was for private, and £3202 for public lighting; meter-rents brought in £883; and the sale of residuals, £7118. The total receipts were £39,137; leaving a gross profit of £9963. Income-tax and interest on consumers' deposits will be taken off the gross profits, and £500 will be added to the reserve fund; leaving a net profit of £9098 to be handed over to the city fund, as against £8148 last year—being an increase of £950. Comparing the accounts with those for the year 1885-6, the total expenditure was then £26,933, including £22,313 for the manufacture of gas, £1771 for its distribution, and £972 for management. The amount received from the sale of gas was £28,587; from the rental of meters, £860; and from the sale of residual products, £5764. There was a sum of £1927 more expended on the manufacture of gas, chiefly made up of £1678 paid for coals and £248 in the shape of wages. To counterbalance this, there was a sum of £1847 more received for gas sold, most of which was for private lighting. The increase in the receipts from residuals—£1354—has put the Committee into their present satisfactory position.

Turning to the Water Department, the amount of water-works loans owing at the beginning of the year was £14,296; the original sum having been £28,629, borrowed at from 3 to 3½ per cent. During the year £2071 was paid off, and the amount now owing is £12,225. A sum of £319 was spent on new mains; bringing up the total expended on fixed plant to June 30, 1897, to £72,776. The revenue account shows that the net amount of water-rents accrued to date came to £8910. Against this there were charges of £2704 for maintenance, and £509 for management—a total of £3213; leaving a balance of £5697. The debit side of the profit and loss (net revenue) account is as follows: Income-tax, £159; paid to the district fund, £5038; balance, £7932—total, £13,129. The figures on the credit side are: Balance from last account, £7413; interest on banking account, £19; revenue account (profit transferred), £5697—total, £13,129.

The Liability for Injury to Gas and Water Pipes by Electrolysis.—Not only in New Jersey are proceedings being threatened for damage to gas and water pipes through electrolysis, as mentioned in the "Journal" last week, but also in Massachusetts. We learn that the President of the Spencer Gas Company (Mr. L. Hill), has notified to the proprietors of the Worcester and Suburban Street Railway Company that, unless the latter make suitable payment for damage done to his Company's mains and services, which they put at $400, a suit will be instituted.

PROJECTED EXTENSION OF THE HALIFAX CORPORATION WATER WORKS.

On Wednesday a Meeting of the Halifax Town Council in committee was held, to discuss the question of taking steps forthwith for reviving the powers for the construction of a new reservoir at Walshaw Dean. The gathering-grounds for this were secured in 1888; but the period allowed (seven years) has now lapsed. Walshaw Dean and the gathering-grounds which feed its streams lie, geographically speaking, next door to Widdop; but, for quality and purity, the water in the new area is probably the best in that district of the West Riding. Mr. W. A. Wainhouse (the Chairman of the Water Committee) said that the growth and welfare of the town, both from a commercial and sanitary point of view, depended in a large measure upon an adequate and never-failing supply of good, pure water. Had the same conditions of rainfall and so forth prevailed during this year as in 1887, they would now have only about eight or nine days' supply in the reservoirs. They had not to provide for wet years, but for abnormally dry ones; for the Corporation were committed by Act of Parliament to supply water to outside authorities, and it would be a very serious thing indeed financially were the town's supply to become inadequate. He presented a tabulated record which showed that for the five years 1882-1886 the average yearly consumption was 683 million gallons; from 1887 to 1891, the average consumption had increased to 776 million gallons; while from 1892 to the end of 1896, the average had mounted up to 818 million gallons. He moved that steps be taken to revive the parliamentary powers for constructing water-works at Walshaw Dean. The Water Committee were, he said, unanimous on the subject. The total cost of the scheme was estimated at upwards of £150,000. As an amendment, Mr. W. C. Hebden moved that the subject be deferred for twelve months. Although he quite agreed with Mr. Wainhouse in everything he had said with regard to the necessity for foresight in securing an adequate water supply, he much doubted his figures as to consumptive requirements and normal increase; and it was not necessary at the present juncture to lay out another £150,000 in water-works. They had, he felt sure, an adequate supply of water for ten years to come. Mr. J. T. Simpson, who seconded the amendment, said he was fully convinced that there was no greater necessity at the present time for carrying out the scheme than there was in 1886. In the lengthy discussion which took place, Alderman Spencer, Mr. H. E. Greenwood, Mr. J. Wade, and Mr. A. Bottomley supported the resolution, while Alderman Braithwaite and several others opposed it. The Town Clerk pointed out that the resolution simply committed the Council to reviving the parliamentary powers—nothing further; and Alderman Gaukroger emphasized the danger of allowing other authorities to get hold of the Walshaw area. Mr. Hebden said if that was all the resolution contemplated, he would withdraw his amendment. The resolution was thereupon put and carried, with one dissentient.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The report by Mr. Foulis, of Glasgow, on the proposed extension of the Dundee Corporation Gas-Works, I am afraid, goes further than was calculated upon when he was called in. I fancy some members of the Corporation agreed to the remit in the hope that Mr. Foulis would find them a way out of their tight place, which would involve less cost than the proposals of Mr. W. M'Crae, their own Engineer, were likely to lead them into. These will be disappointed with the result. Other members would go into the matter in the expectation that Mr. Foulis would support Mr. M'Crae. To them the proposal to enter upon a scheme of gradual reconstruction of the works will not be altogether acceptable. And yet Mr. Foulis would not have been justified in doing anything else than he has done. Works which have been built up piecemeal, as those in Dundee, and many others, have, can best be dealt with in the way recommended. To do anything less, would merely be a policy of tinkering; and the reconstruction would be still to come. The recent introduction into gas-works of mechanical appliances makes compactness now more than ever a necessity. This is a plea for reconstruction which would not strike former designers of extensions with the same force as it now does. There are considerations which may lead to Mr. Foulis's scheme not being altogether favourably received. In fact, there is every probability that he will have to educate the Town Council, or, at all events, the Gas Committee. In this connection, a deputation to Glasgow to see the magnificent works there, may be heard of by-and-bye. I observe that already there is a failure on the part of one of the local newspapers to grasp the situation. Seizing upon the statement that, had the land in the possession of the Corporation been properly utilized, a purchase of ground at this time would have been unnecessary, the Editor holds it to be an indication that the city is to be called upon to pay for the results of bad management, or at all events of insufficient foresight. This, surely, is not the inference to be drawn. The late Mr. John M'Crae was as capable as any man of making gas under the least favourable conditions; and it is doubtless the case that, like many other managers, he plodded on with insufficient plant, in order to keep down the capital account. Times have changed, however. Competition requires that the most shall be made of every inch of space and of every ounce of material in the works; and this can only be obtained by the adoption of improved methods. The appliances for the working of these will not fit into old buildings; therefore new buildings are necessary. Mr. Foulis points out that reconstruction will be profitable. If he can convince the Dundee Corporation of this, his task will be considerably relieved. His arguments will be convincing enough—I have no fear of that—with the Committee. But there is an obtuse community behind the Committee, whose view in the matter will have to be respected; and their opinions on economic subjects are often the reverse of intelligent. It is no part of Mr. Foulis's duty to educate the community. That lies to the hand of the Corporation; and if they act wisely, they will see to it that the community are properly led on the subject before some Ratepayers' Association, or other similar collection of ill-informed entities, have the opportunity of confusing the issue before them.

In this matter of the Dundee Gas-Works, journalistic enterprise led to the publication of a preliminary paragraph regarding Mr. Foulis's report. This paragraph deals with subjects which are found not to be contained in the report; and therefore it might be set aside as of no account. But I lean to the view that, though not in the report itself, the statements it contains are the opinions of Mr. Foulis, derived somehow; and therefore I give it. It is as follows: "It is understood that Mr. Foulis advocates a complete reconstruction of the gas-works on the lines followed at the Tradeston Gas-Works, Glasgow; expressing the opinion that the Dundee works are obsolete. He points out that Dundee is manufacturing a much too costly gas; and that if 22-candle power is sufficient for Glasgow, surely 25-candle power is not necessary in a manufacturing community like Dundee. Besides, he mentions that Dundee is manufacturing gas from too fine a coal; that by purchasing a cheaper coal a large saving would be effected; and that, in addition, Dundee would have a supply of coke which would be worth money, whereas at present Glasgow largely supplies the city with coke. It may be mentioned that the Tradeston works are managed very extensively on mechanical principles; and that, whereas there are several hundred men employed in connection with the local gas-works, there are not more than fifty engaged at Tradeston."

The Gas Committee on Tuesday considered Mr. Foulis's report, and resolved to write to him asking for further information, and particularly regarding his estimate of what the cost will be. A Sub-Committee were also appointed, to meet with the proprietors of the ground which it is proposed to purchase, for the purpose of ascertaining whether a portion of the ground might be acquired, and on what terms.

An action by the Bothwell and Uddingston Gas Company against a gas consumer has been decided in the Glasgow Sheriff Small Debt Court. The Company sued for £5 5s. 8d., for gas supplied between May 28, 1896, and April 30, 1897. The defender said that the quantity of gas registered was not consumed, but was lost through a leak in the fittings of the house. The Sheriff ruled that the Company had nothing to do with the condition of the internal gas-fittings, but that the consumer, having entered into a contract to pay for the quantity of gas registered by the meter, must do so. Whatever right of relief he might have against the proprietor of the house, for loss sustained on account of the condition of the fittings, did not affect the question with the Gas Company, who must be paid for the gas registered. Decree, with expenses, was accordingly given.

An extension of the works belonging to the Larkhall Gas Company is now complete. Two new purifiers have been erected; the old purifier shed has been converted into a lime-store; and a new station meter has been put in. The retorts in use have been converted into a regenerative system. Mr. T. Stewart has been Manager of the works for 18 years. In his time, the number of retorts have been doubled, the annual output of gas has risen from 3½ to 13½ million cubic feet, and the price has been reduced from 5s. 5d. to 3s. 4d. per 1000 cubic feet.

The works of the Kilmalcolm Gas Company are being greatly improved, according to plans prepared by Mr. James Brodie, the Manager. The retort-bench is being converted into a regenerative system; and new mains and other appliances are also being introduced.

The Directors of the Milngavie Gaslight Company have lately communicated with the Glasgow Corporation Gas Committee, asking if they were willing to consider the acquisition of the gas supply undertaking of that northern burgh, in the full knowledge that their near neighbours of New Kilpatrick, or Bearsden, only about a mile or a mile and a half nearer the city, were getting gas from the Corporation at the Glasgow price, which is 2s. 2d. per 1000 cubic feet. The Gas Committee gave some consideration to the subject; and then they listened to a verbal statement dealing with the matter from the General Manager (Mr. Foulis). They ultimately resolved on declining to entertain the proposal. By-and-bye, they may get the concern at the price of an old song.

A grievance in connection with stair lighting has been discovered in Glasgow. The Corporation charge 10s. per burner, which is, in many instances, collected by the proprietors along with the rents payable by the occupants, and is paid by them to the Corporation. If there be two tenants in a stair, each should pay 5s.; and if there be four tenants, each should pay 2s. 6d. But it has been discovered that proprietors, or their factors, are in the habit of adding 25 per cent. to the amount, which, of course, is a practical addition to the rent. The subject was before the Town Council this week; and the Clerk gave his reading of the law to be that the tenants are entitled to refuse to pay more than their proportion of 10s. After this opinion, there will be some trouble in collecting more than the sum due.

On Tuesday of this week, a portrait of Councillor A. Osborne, who is the Father of the Glasgow Town Council, and who has been Convener of the Water Committee of that body for many years, was presented to the Corporation, to be placed in the Corporation Galleries; a replica being presented to Mrs. Osborne. The ceremony of presentation was so arranged that it took place at the same hour, in the same day of the month, and the same day of the week, as that in which Mr. and Mrs. Osborne were married to each other fifty years before. This was an interesting circumstance to which Mr. Osborne was able to refer, as was also the fact that during all these fifty years the spectre of death has never entered their home. Indeed, Mrs. Osborne and all their family attended the presentation ceremony. Mr. Osborne has sat in the Town Council continuously since 1862. He was a Magistrate of the city from 1867 to 1870, and has held other offices.

For the current year, the Water Committee of the Aberdeen Town Council have estimated their expenditure at £24,840, which is expected to leave a surplus of £79. They have resolved to recommend that the public rate for water be reduced from 1½d. to 1¼d. per pound, and that the domestic rate be reduced from 7d. to 6d. per pound.

Proposed Water-Gas Plant for Halifax.—The Gas Committee of the Halifax Corporation are reported to be considering at the present time the construction of plant for supplying carburetted water gas. They have, we are told, fully resolved to manufacture such gas, but have not decided who shall make the required plant. The addition that it is suggested shall be made to the gas-works will cost from £8000 to £10,000, and will be equal to an output of a million and a quarter cubic feet of gas per day.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—There is still no movement of any moment to notice in the coal trade. House-fire qualities are, of course, beginning to meet with rather more inquiry; but so far the increased demand has had no appreciable effect in improving prices. These remain at 9s. 6d. to 10s. per ton for best Wigan Arley; 8s. to 8s. 6d., for Pemberton four-feet and seconds Arley; and 6s. 6d. to 7s., for common house coal. Common round coals are, if anything, hanging rather more upon the market, owing to the stoppages of works; and engine fuel is more plentiful than it has been of late. Steam and forge coals are perhaps not quite firm at the full quoted price of 6s. to 6s. 3d. per ton at the pit; but engine fuel is steadily maintaining late rates—averaging 3s. to 3s. 6d. per ton for common, 3s. 9d. to 4s. 3d. for medium, and 4s. 6d. to 4s. 9d. for better qualities. For shipment, there is a moderate inquiry, with steam coals fetching 7s. 6d. to 7s. 9d. per ton delivered at the Mersey ports.

Northern Coal Trade.—There is a slight weakness in the demand for steam coals; but this is more than counterbalanced by the growth of the demand for gas coals, as is usual at this season. The steam coal trade suffers from slackening of the demand for export to some countries; but it is probable that it will recover prior to the closing of the navigations in a few months' time. Best Northumbrian steam coals are quoted at 8s. 9d. per ton f.o.b.; second qualities are about 8s.; and steam smalls, 3s. 6d. to 3s. 9d. The strike of the engineers is at last affecting the consumption of manufacturing fuel generally; and prices of some kinds are a little easier in consequence. Bunker coals are generally firm, the demand being good; and the price is steady at from 7s. to 7s. 6d. per ton f.o.b. Household coals are still quiet, the consumption being limited. In the gas coal trade, the demand is begining to increase satisfactorily; and the price is firmer. The shipments are increasing; and the local use is also becoming larger. Prices vary more than they did; but from 7s. 6d. to 8s. per ton f.o.b. are now the general quotations. In coke, there is a full demand, and sales have taken place for delivery during the winter at 16s. 6d. per ton f.o.b.; while for home consumption the generally quoted price is about 13s. 6d. per ton at the furnaces. There is no change this week in gas coke; but the increasing output is being well taken up.

Scotch Coal Trade.—The miners have begun an agitation for an increase of wages; and in support of it, they have adopted the policy of working only five days per week. This has had the effect of raising prices a little. The upward movement is likely to be checked very speedily, as the engineering dispute has spread to Scotland, and the home consumption will be affected as it has not been yet in the struggle. The shipping branch of the trade is very brisk, and is likely to remain so till the Baltic is frozen up. The prices quoted are: Main, 7s. per ton f.o.b. Glasgow; ell, 7s. 3d. to 7s. 9d.; and splint, 7s. 6d. The shipments for the week amounted to 196,764 tons—an increase of 21,338 tons upon the previous week, and of 28,180 tons upon the corresponding week of last year. For the year to date, the total shipments have been 5,179,656 tons—an increase over the corresponding period of last year of 172,828 tons.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 4.

Sulphate of Ammonia.—The greater activity noticed in last report has continued throughout the week; but actual business done has been limited by scarcity of supplies. There has been a further advance in values; and the closing quotations are £7 15s. to £7 17s. 6d. per ton f.o.b. at the ports. Consumers have displayed a greater disposition to operate. But they are not convinced of the permanence of the improved market, and they have been slow to follow the advance. Considerable sales have been made in London at £7 12s. 6d. per ton, Beckton terms, delivery up to the end of the year. There is good inquiry for spring delivery; and some further advance could no doubt be obtained. But makers decline to quote; and speculators are not venturing to offer, unless at a substantial premium.

Nitrate of Soda is steady on spot, at 7s. 6d. per cwt. for good up to 7s. 7½d. per cwt. for fine quality. In the forward position, the market is quieter; but sellers decline to entertain business at any concession upon recent prices.

LONDON, *Sept.* 4.

Tar Products.—There is no change in this market, excepting perhaps a little more life in anthracene. The low price to which this article has fallen has aroused the attention of buyers; and it is not impossible that important business may eventuate should values continue at the present low range. Benzols are flat, with no new business reported; while creosote continues to show an idle market. Naphthalene is also wanting in interest; but there are signs that this article may return to better prices. Carbolic acid is quoted lower; but very little business is being done. There is some inquiry, however, for disinfecting liquid, which has improved its position. Large tar contracts have been closed during the past few weeks, at prices ranging from 15s. to 20s. 6d.

To-day's values are: Tar, 17s. to 21s. Pitch, 17s. to 21s. Benzol, 90's, 1s. 10½d.; 50's, 2s. Toluol, 2s. 4d. Solvent naphtha, 1s. 7d. Crude, 30 per cent., naphtha, 11d. Creosote, 1¼d.; liquid, 2¼d. Heavy oils, 42s. 6d. Carbolic, 60's, 1s. 10d. Naphthalene, 40s.; salts, 20s. Anthracene, "A," 6d.; "B," 4d. to 5d.

Sulphate of Ammonia has shown considerable activity; and a general advance in price took place in the commencement of the week. A large business has been reported at £7 15s., less 3¼ per cent., though to-day's market quotation is a shade less. The market is in a distinctly sounder position than it has been for some time; and it would not be surprising if values still further improved.

Rejection of Incandescent Gas-Lights at Felixstowe.—The General Purposes Committee of the Felixstowe District Council submitted a recommendation at their last meeting to the effect that the extra payment to the Water and Gas Company for incandescent gas-burners should be discontinued, on the ground that the additional light afforded was not worth the increased expense the lamps entailed. The recommendation was adopted.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 524).

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	9 Apl.	10½	Alliance & Dublin 10 p. c.	24–25	..	4 4 0
100,000	10	,,	7½	Do. 7 p. c.	17–18	..	4 3 4
300,000	100	1 July	5	Australian (Sydney) 5% Deb.	106–108	..	4 12 8
200,000	10	27 May	7	Belgrano (B. Ayres), Limited	9½–10	..	7 0 0
100,000	Stck.	29 June	5	Do. 5 p. c. Deb. Stk	103–106	..	4 14 4
200,000	5	27 May	6½	Bombay, Limited	6¾–7¼	..	4 9 7
40,000	5	,,	6½	Do. New, £4 paid	5¼–5¾	..	4 10 7
330,000	Stck.	27 Aug.	12	Brentford Consolidated	297–302*	..	3 19 5
240,000	,,	,,	9	Do. New	220–225*	..	4 0 0
50,000	,,	,,	5	Do. 5 p. c. Pref.	145–150*	..	3 6 8
159,375	,,	11 June	4	Do. 4 p. c. Deb. Stock.	135–139	..	2 17 6
220,000	Stck.	25 Mar.	11½	Brighton & Hove Original	273–278	..	4 2 8
208,820	,,	,,	8½	Do. A Ord. Stk.	201–206	..	4 2 6
933,500	Stck.	27 Aug.	5	Bristol, 5 p.c. max.	130–135*	..	3 14 1
420,000	20	26 Mar.	11½	British	56–57	..	3 18 11
50,000	10	27 Aug.	11½	Bromley, Ordinary 10 p. c.	23–25*	..	4 12 0
71,000	10	,,	8½	Do. 7 p. c.	18–20*	..	4 5 0
500,000	10	28 Apl.	6	Buenos Ayres (New) Limited	10½–11½	..	5 4 4
98,122	Stck.	—	4	Do. 4 p. c. Deb. Stk.	98–100	..	4 0 0
150,000	20	15 July	8½	Cagliari, Limited	30–32	..	5 3 1
100,000	10	11 June	8	Cape Town & District, Ltd	16½–17½	..	4 11 8
50,000	50	3 May	6	Do. 6 p. c. 1st Mort.	58½–59½	..	5 0 10
550,000	Stck.	9 Apl.	13½	Commercial Old Stock	343–348	..	3 17 6
165,000	,,	,,	10½	Do. New do.	257–262	..	4 0 1
165,000	,,	11 June	4½	Do. 4½ p. c. Deb. do.	155–158	..	2 16 11
800,000	Stck.	11 June	13	Continental Union, Limited.	255–260	..	5 0 0
200,000	,,	,,	10	Do. 7 p. c. Pref.	215–220	..	4 10 11
51,600	Stck.	27 Aug.	14	Croydon Com'cial A 10 p. c.	315–320*	..	4 7 6
163,400	,,	,,	11	Do. B 7 p. c.	252–257*	..	4 5 7
535,000	Stck.	12 Aug.	5½	Crystal Palace Ord. 5 p. c. Stk	137–140	..	3 15 0
60,000	,,	,,	5	Do. 5 p. c. Pref.	140–143	..	3 9 11
486,090	10	29 July	11	European, Limited	25–26	+½	4 4 7
354,060	10	,,	11	Do. £7 10s. paid	18–19	+½	4 6 11
5,896,590	Stck.	12 Aug.	12½	Gaslight & Coke, A, Ordinary	317–320	..	3 19 8
100,000	,,	,,	4	Do. B, 4 p. c. max.	113–118	..	3 7 10
665,000	,,	,,	10	Do. C, D, & E, 10 p. c. Pf.	315–320	..	3 2 6
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	150–155	..	3 4 6
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	220–225	..	3 6 8
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	203–208	+1	3 7 4
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	315–320	..	3 2 6
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	180–185	..	3 4 10
1,061,150	,,	11 June	4	Do. 4 p. c. Deb. Stk.	138–141	..	2 16 9
294,850	,,	,,	4½	Do. 4½ p. c. do.	155–158	..	2 16 11
908,000	,,	,,	6	Do. 6 p. c. do.	207–212	..	2 16 7
70,000	10	13 May	6	Hongkong & China, Limited	13½–14½	..	4 2 9
3,800,000	Stck.	13 May	10	Imperial Continental	217–222	..	4 10 2
376,400	100	3 Aug.	4	Do. 4 p. c. Debs. Red.	99–102	..	3 18 5
473,600	Stck.	12 Aug.	3½	Do. 3½ p. c. Deb. Stk ,,	104–107	..	3 5 5
75,000	5	29 June	6	Malta & Mediterranean, Ltd.	5½–6	..	5 0 0
560,000	100	1 Apl.	5	Met. of Melbourne, 5 p. c. Deb.	112–114	..	4 7 8
250,000	100	,,	4½	Do. 4½ p. c. Debs.	108–110	..	4 1 10
541,920	20	11 June	5	Monte Video, Limited	15–16	..	6 5 0
150,000	5	27 May	8	Oriental, Limited	8¼–8¾	..	4 11 5
135,000	5	,,	8	Do. New, £4 10s. paid	7¼–7¾	..	4 12 10
15,000	5	,,	8	Do. do. 1879, £1 paid	1¾–2	..	4 0 0
60,000	5	26 Mar.	7	Ottoman, Limited	4¾–5¼	..	6 13 4
420,000	100	3 May	6	People's Gas } 1st Mtg. Bds.	104–109	..	5 10 1
500,000	100	1 June	6	of Chicago } 2nd Do.	105–110	..	5 9 1
250,000	10	27 May	10	San Paulo, Limited	14½–15½	..	6 9 0
5,475,000	Stck.	12 Aug.	5½	South Metrop., 4 p.c. Ord.	145–148	..	3 10 11
1,416,667	,,	15 July	3	Do. 3 p.c. Deb. Stk.	105–109	..	2 15 0
60,000	Stck.	12 Mar.	12†	Tottenham & Edmonton, A	275–285	..	4 4 2
60,000	,,	,,	9†	Do. B	190–200	..	4 5 0
182,380	10	27 May	10	Tuscan, Limited	13½–14½	..	6 18 0
149,900	10	1 July	5	Do. 5 p. c. Debs. Red.	100–103	..	4 17 1
				WATER COMPANIES.			
746,159	Stck.	29 June	10½	Chelsea, Ordinary	335–340	+½	3 1 9
150,000	,,	,,	5	Do. 5 p. c. Pref.	177–180	..	2 15 6
160,000	,,	,,	4½	Do. 4½ p. c. Pref. Stk., 1875	157–160	..	2 16 3
175,785	,,	26 Mar.	4½	Do. 4½ p. c. Deb. Stock	160–165	..	2 14 6
1,720,560	Stck.	9 Apl.	7	East London, Ordinary	224–228	..	3 1 4
654,740	,,	29 June	4½	Do. 4½ p. c. Deb. Stk.	163–166	..	2 14 3
390,000	,,	,,	3	Do. 3 p. c. Deb. Stk.	106½–107½	..	2 15 10
700,000	50	11 June	7½	Grand Junction, 10 p.c. max.	120–125	..	3 0 0
295,000	Stck.	26 Mar.	4	Do. 4 p. c. Deb. Stk.	148–153	..	2 12 4
708,000	Stck.	12 Aug.	13	Kent	350–355	..	3 13 3
160,000	,,	,,	7	Do. New, 7 p. c. max.	210–215	..	3 5 1
1,043,800	100	29 June	9½	Lambeth, 10 p. c. max.	288–293	..	3 6 6
406,200	100	,,	7½	Do. 7½ p. c. max.	220–225	..	3 6 8
350,000	Stck.	26 Mar.	4	Do. 4 p. c. Deb. Stk.	147–150	..	2 13 4
500,000	100	12 Aug.	13	New River, New Shares.	442–447	+5	2 18 2
1,000,000	Stck.	29 July	4	Do. 4 p. c. Deb. Stk.	151–154	..	2 11 11
902,300	Stck.	29 June	5	S'thwk & V'xhall, Ordinary	160–163	..	3 1 3
126,300	100	,,	5	Do. Do. 7½ p. c. Max.	151–154	..	3 4 11
489,200	Stck.	,,	5	Do. Do. 5 p. c. Pref.	173–178	..	2 16 2
1,019,585	,,	9 Apl.	4	Do. 4 p. c. A Deb. Stk.	145–148	..	2 14 2
1,155,066	Stck.	11 June	10	West Middlesex	313–318	..	3 2 10
200,000	,,	,,	4½	Do. 4½ p. c. Deb. Stk.	163–166	..	2 14 3

† Next dividend will be at this rate. *Ex div.

Gas-Works Extensions at Spalding.—At the meeting of the Spalding Urban District Council, last Wednesday, it was decided to build a new retort-house at an estimated cost of £2000. The house is to accommodate twelve beds of retorts, of which it is proposed at first to put in six, which, it is thought, will be sufficient for the requirements of the town for the next twenty years.

The Driffield Gas Company's Transfer.—At an extraordinary meeting of the shareholders of the Driffield Gaslight Company, recently held, it was resolved that the Company be wound up voluntarily, with the Clerk of the Company (Mr. G. B. Tonge) as Liquidator. The undertaking, it will be remembered, was recently purchased, and is now being carried on, by the Urban District Council for Great Driffield.

Proposed Purchase of the Holyhead Water-Works by the Corporation.—Last Friday week, a meeting of owners and ratepayers of Holyhead was held for the purpose of considering the following motion: "That this meeting consents to the promotion by the Holyhead Urban District Council of a Bill in Parliament in the session of 1898, for the purpose of obtaining power to purchase compulsorily the undertaking of the Holyhead Water-Works Company, and that all steps be taken to carry out that object." After considerable discussion, the motion was carried by a majority of four votes. A poll of the town was demanded.

Devonport Corporation and the Water-Works.—Though little has been said of late as to the proposal of the Devonport Corporation to purchase the undertaking of the Devonport Water Company, the project does not seem to have been altogether lost sight of. At a recent meeting of the Town Council, the Water Committee reported that they had discussed the question of the promotion of a Bill for the acquisition of the works, and, as a preliminary, had instructed the Town Clerk to apply for information as to the financial condition of the undertaking. No further particulars were afforded; but it appears to be assumed that the idea of the Committee is to go to Parliament next session if the preliminaries can be adjusted in time for the notices to be given.

Bolton Corporation Water Supply.—A statement has been presented to the Water Committee of the Bolton Corporation giving a comparison of the finances of the department for the two years ending March last. This showed that the income for 1896-97 aggregated £59,715, as against £56,155 in the previous financial year. The principal items on the income side for the past twelve months were £35,656 for water supplied for domestic purposes; £17,493 for water supplied for trade purposes; £2485 from the Urban District Councils of Westhoughton and Atherton; £1430 as profit on fittings; £676 for hired meters; £478 for rents of farms at Entwisle and elsewhere; and £451 from firms having automatic sprinklers. The chief item on the expenditure side for the twelve months was £26,128 for interest. A sum of £5027 was expended on maintenance of works, £4735 went for rates and taxes, £3284 for instalments on loans, £2414 to the sinking fund, and £2201 for officers' salaries. The amount placed to the renewal fund was £2500, and £11,573 was handed over to the borough fund as profit for the year, against £10,000 in March, 1896.

High Wycombe Water Supply.—The Directors of the High Wycombe Water Company, Limited, have instructed their Engineer and Secretary (Mr. J. Frederick Wicks) to carry out additions to their works in accordance with his plans and specifications. The work comprises new engine and boiler houses, with Worthington engine and boiler, a new 10-inch rising main, and a high-level reservoir situated 523 feet above Ordnance datum. This extension is intended to supplement existing works, and to provide a water supply to the higher districts within the Company's radius of supply.

Keighley Corporation Water Supply.—At last Tuesday's meeting of the Keighley Town Council, the Chairman of the Water Committee (Alderman Brigg) reported a considerable increase in revenue from water supplies for the year ended June 30. The total amount received was £5833, as against £5479 last year—in round figures an increase of £400. The total value of the water-works, as estimated by the money expended upon them, is £234,448. Of this sum £186,657 is still owing; so that nearly £50,000 has been repaid through the sinking fund. In reply to a question, Alderman Brigg said that the loss on the year's working was about £190.

Ilkeston Water Supply.—The boring for water which the Corporation of Ilkeston have commenced at Little Hallam, has now reached a depth of more than 1750 feet. Water of an excellent quality was met with at about 800 feet, in the first millstone grit; but it was the opinion of geologists that a greater supply would be found in the second millstone grit (the existence of which had been proved by the recent borings at Ruddington), and the Corporation accordingly resolved to bore to a depth not exceeding 1800 feet. Within 50 feet of that depth, however, no further water has been reached, though the boring has now penetrated quite into a rough sandstone, after passing through a great depth of blue bind. The Corporation are not now very sanguine of meeting with more water within the depth to which it has been decided to bore.

The Portsmouth Corporation and the Water Company.—The Corporation of Portsmouth, as our readers are aware, are desirous of acquiring the undertaking of the Portsmouth Water Company. The Directors of the Company have been communicated with; and it has been ascertained that the purchase would cost more than a million sterling. The Local Government Board were asked to extend from 60 to 80 years the time for the repayment of the money which must be borrowed; but they declined to do so, and intimated that they should oppose such a proposal if embodied in a Bill. Recently, as already recorded (*ante*, p. 184), attention has been directed to the Company's charges; and the opinions of Counsel have been taken. Mr. Asquith, Q.C., and Mr. Cripps, Q.C., consider that the Company are not justified in charging upon the gross value of the houses; but that their assessments should be based upon the rateable value. Sir E. Clarke, Q.C., inclines to the view that the Company are authorized, under the provisions of their Act of 1857, to charge upon the rent; but he is not very positive upon the point. The Special Committee who have the water question in hand are about to submit the legal opinions to the Town Council, and ask for further instructions.

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The Proposed Purchase of the West Cowes Gas-Works by the Corporation.—At the meeting of the Cowes Town Council last Tuesday, the Gas Committee reported the receipt of a letter declining the offer of the Council with reference to the purchase of the works of the Cowes Gas Company. The Committee recommended that Mr. E. H. Stevenson be appointed Arbitrator for the Council, and further thought it desirable that the arbitration should take place in Cowes. One of the members of the Council wished to know the amount of the offer made to the Company; but the Chairman pointed out that, by the resolution already passed by the Council, such matters must be kept private. The member thereupon threatened to resign his seat on the Council unless he knew the amount. The report was adopted.

Tiverton Corporation Gas Supply.—The statement of accounts relating to the Tiverton Corporation Gas-Works to March 31 last, shows that the purchase of the works from Messrs. Heathcoat and Co. was duly completed on March 16 last. The Corporation borrowed £20,000 from the National Provincial Bank, at 2½ per cent., until the year 1900, when the question of the amalgamation of the whole of the Municipal loans will be considered. The revenue account showed a balance of income for the year of £1838, which has been carried to profit and loss account. After providing for the payment of income-tax and interest, the balance of the profit and loss account for the two years amounted to £2148, which is placed to a reserve fund account as working capital. In future years, the profit and loss account will be charged with the annual sum of £900 for sinking fund, and with interest on the loan which at present amounts to £500. An additional sum of £2000 is to be borrowed to pay for extensions; and in this will be included £1000 spent on capital account during the past year. The make of gas during the year was 28,317,000 cubic feet, of which 25,805,900 cubic feet were used or sold—leaving 2,471,200 cubic feet unaccounted for. The use of gas-stoves is rapidly increasing in the district.

Shrewsbury Water Supply.—The new water supply scheme for Shrewsbury is not to go forward unopposed, as at a ward meeting held last Wednesday it was unanimously resolved—"That, having considered the scheme, it desired to record its emphatic disapproval of the action of those aldermen and councillors of the borough who are endeavouring to force it upon the town against the wishes of the great majority of the ratepayers." The scheme, it may be remembered, consists in taking water from the Severn near Shelton, the erection of a pumping station, subsiding tanks, and filter beds within the borough, and then pumping the water to a covered service reservoir near Hanwood Station, about four miles from the town. This reservoir will be 108 feet above the highest ground level in the borough. The scheme is opposed on the ground that filtered river water is not altogether reliable; that pumping will entail a continual annual expense; and that the present supply of drinking water from the conduit head is an excellent one, and may be further extended. The scheme has been fully laid before the ratepayers of the borough and their votes taken upon it; and they have condemned the scheme by a large majority. But the Council have, notwithstanding, given notice of their intention to apply to the Local Government Board for a loan of £48,000, to carry it out.

Reductions in Price.—The Directors of the Heckmondwike Gas Company intend to reduce the price of gas by 2d. per 1000 cubic feet from the commencement of 1898. A rebate of 5 per cent. on their price of 3s. 4d. per 1000 cubic feet is to be allowed by the Shotley Bridge and Consett Gas Company, from the 30th inst. The Rossendale Union Gas Company have decided to reduce the price of gas to consumers of under 100,000 cubic feet per week from 3s. 5d. to 3s. 2d. per 1000 cubic feet, the price when the quarterly consumption is more than 700,000 feet, being 2s. 10d. per 1000 cubic feet, with a discount of 2½ per cent. provided the amount is paid in a month.

The Farnworth and Kearsley Gas Company's Charges.—The authorities whose districts are served by the Farnworth and Kearsley Gas Company have resolved to approach the Directors jointly, with the view of securing a reduction in the price of gas. It is alleged that the Company are charging 20 per cent. more than the Bolton Corporation on the one hand, and the Salford Corporation on the other. In Great Lever, which adjoins Farnworth on the Bolton side, the price is 2s. 6d. per 1000 cubic feet net; while in Farnworth and the townships served by the Company named, the charge is 3s. net. At the last meeting of the Farnworth District Council, it was suggested that steps should be taken to push on the electric lighting scheme, so as to put the Council in a better position to deal with the Gas Company.

Goole Water Supply.—The Gas and Water Committee of the Goole Council have at last taken steps to improve the town's water supply, which had obtained a very bad reputation on account of its hardness and its dirty and discoloured condition. The opinion of several experts has been obtained; and at a recent meeting reports were read from two analysts to the effect that the water contained nothing injurious to health. It was, however, extremely hard—being 32°, as against 9°, the average for the country. Mr. Newbigging has submitted two schemes for dealing with it. The system of purification was rejected as being too costly; and the Committee decided to recommend the Council to adopt a plan for filling in 250 feet of the well with sand and shingle, so as to raise the level above the outcrop of peat into the well, which was suspected of causing the pollution and discoloration.

Manchester Out-Townships and the Price of Gas.—The General Purposes Committee of the Urban District Council of Withington have taken into consideration the recent action of the Manchester City Council in reference to the rejection of the unanimous recommendation of the Gas Committee to reduce the price of gas and to abolish meter-rents in the out-townships. Communications on the subject received from the District Councils of Gorton, Levenshulme, and Moss Side were also considered at the same meeting. The Committee recommended that the Withington Council shall advise and support combined action being taken by the districts affected, with the view of obtaining the introduction into Parliament of a Bill, the object of which shall be to relieve all gas consumers in the out-townships supplied by the Manchester Corporation from the indirect taxation now imposed upon them in the form of excessive charges for gas and meter-rents. It was resolved that an early meeting of the Local Authorities interested be convened to consider what action shall be taken.

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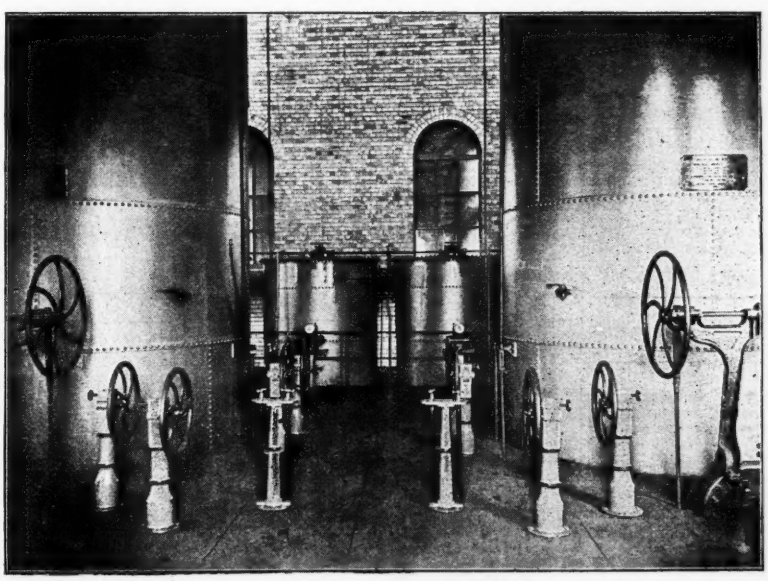

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Warrington Corporation Gas Department.—The annual report of the Gas Engineer to the Warrington Gas Department (Mr. W. S. Haddock) has been issued. It refers, in the first place, to the manufacturing plant; stating that the extensions at the Longford station are now sufficiently advanced to close the Mersey Street works. The increase in the make of gas during the year was 12,397,400 cubic feet, or 4·85 per cent. The working results were: Coal and cannel carbonized, 26,641 tons; previous year, 24,933 tons. Gas made, 267,744,900 cubic feet; previous year, 255,347,500 cubic feet. Gas made per ton, 10,050 cubic feet; previous year, 10,241 cubic feet. Gas sold and accounted for, 243,626,397 cubic feet; previous year, 234,580,780 cubic feet. Gas unaccounted for, 24,118,503 cubic feet; previous year, 20,766,720 cubic feet. The illuminating power averaged 18·69 candles. The expenditure in the past year was £35,399, as compared with £35,047; and the estimated receipts were £53,818, against £50,711. The report also gives some interesting particulars as to the maximum and minimum makes and consumption of gas. The largest quantity made in twenty-four hours was 1,291,100 cubic feet, on Dec. 23. The greatest amount sent out in a week was 9,015,600 feet, during the seven days ending Dec. 21; and the largest demand in a single day was on the date named, when 1,507,400 feet were distributed. The smallest quantity consumed in a day was on June 7; the amount being 270,100 feet.

The Proposed Purchase of the Leamington Gas-Works by the Corporation.—Last Tuesday, the General Purposes Committee of the Leamington Town Council had a lengthy discussion of Mr. Newbigging's report (*ante*, p. 444) on the suggested purchase of the gas-works. It may be remembered that the report recommended the purchase of the works for £123,000. Mr. Newbigging, who attended the meeting, was questioned at some length on various points arising out of his recommendations. The Committee, it is understood, finally rejected, by a large majority, the proposition that the Corporation should buy the works on the terms suggested in the report.

An exhibition of gas-stoves and other appliances has lately been held at the Slaithwaite Baths by Messrs. C. Wilson and Sons, of Leeds, under the auspices of the Slaithwaite Gas Company. Miss Holroyd gave lectures on cookery, which were well attended.

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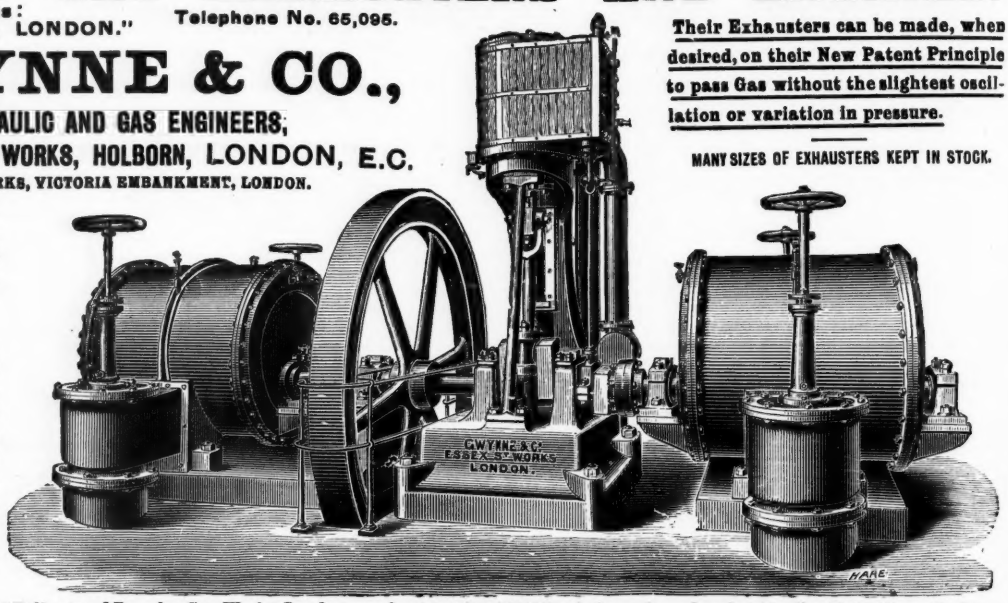

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(GAS DEPARTMENT.)

THE Gas Committee of the above Council invite TENDERS for the supply of 300 4-inch Cast-Iron SOCKET and SPIGOT PIPES.
Forms of Tender and all further Particulars may be obtained from the Engineer, Mr. J. Foster, Gas-Works, Leigh.
Sealed tenders, endorsed "Cast-Iron Pipes," to be sent in to me the undersigned on or before Twelve o'clock NOON, on Monday, Sept. 13, 1897.
By order,
G. DICKINSON,
Clerk.
Town Hall, Leigh, Lancs.,
Sept. 1, 1897.

THE Corporation of Middleton are pre- pared to receive TENDERS for an Installation of INCLINED RETORTS and REGENERATOR FURNACES, at their Gas-Works.
A general Specification and further Particulars may be obtained from Mr. T. Duxbury, Gas Manager.
Tenders, accompanied by the Contractor's own Designs and Specifications, are to be addressed to the Chairman of the Gas Committee, endorsed "Inclined Retorts," and delivered at my Office on or before Wednesday, the 15th of September, 1897.
The Corporation do not bind themselves to accept the lowest or any tender.
FREDERICK ENTWISTLE,
Town Clerk.
Town Hall, Middleton,
near Manchester, Sept. 1, 1897.

NORTHAMPTON GASLIGHT COMPANY.

TENDERS FOR TAR.

THE Directors are prepared to receive TENDERS for the purchase and removal of the surplus TAR produced at their Works, for a term of One or Two Years.
Quantity produced, about 2800 Tons per annum.
Particulars may be had on application.
The Tar will be loaded into Boats or into Railway Tank Waggons on the L. & N.W. Railway.
The Directors do not bind themselves to accept any tender.
Tenders, marked "Tender for Tar," to be delivered at the Company's Office on or before Tuesday, Sept. 14, 1897.
JOHN EUNSON,
Engineer.
Gas-Works, Northampton,
August, 1897.

BLUE PRINTS of all kinds in any weather. Drawings and Tracings promptly executed.
J. L. FEATHERSTONE, 21, Old Queen Street, WESTMINSTER, S.W.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

TO GAS AND WATER OFFICIALS.

DON'T forget to Order your 1898 Cycle from the MELROSE CYCLE COMPANY, COVENTRY.

Price 2s., Post Free.

STEPHEN CARPENTER, on the Puri- FICATION OF COAL GAS BY LIME, OXIDE OF IRON, AND ATMOSPHERIC AIR, and the Method of Working Purifiers so that the Lime may be used a second time, with a Description of Carpenter's short Method of Working off the Sulphur Test, and Table for Calculating Results.
S. CARPENTER, Ryde House, 28, Woodhouse Grove, East Ham, ESSEX.

CORPORATION OF LEICESTER.

SULPHURIC ACID.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the supply of SULPHURIC ACID, made either from native Sicilian Brimstone, or recovered Sulphur, or Pyrites. Specific gravity in each case to be stated.
The Price to include free delivery by Rail into elevated Tanks, 27 feet high, at the Chemical Works, Aylestone Road.
Probable quantity, about 1700 Tons, to be delivered as required during the ensuing Twelve Months.
Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Acid," to be delivered at these Offices not later than Eleven o'clock a.m., on Saturday, Sept. 11.
The Committee do not bind themselves to accept the lowest or any tender.
ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.
Offices: Millstone Lane,
Leicester, Aug. 20, 1897.

SOUTH METROPOLITAN GAS COMPANY.

SALE BY TENDER OF £43,333 6s. 8d. THREE PER CENT. PERPETUAL DEBENTURE STOCK.

MINIMUM PRICE, £105 PER CENT.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER £43,333 6s. 8d. of THREE PER CENT. PERPETUAL DEBENTURE STOCK, in accordance with the Provisions of the South Metropolitan Gas Acts, 1882 and 1896.
Particulars of same, with Form of Tender, can be obtained at this Office on application to the undersigned; and tenders must be sent in on or before Tuesday, the 14th day of September, 1897.
The Stock will be allotted to the highest bidders; but no tender will be accepted at a lower price than at the rate of £105 money for each £100 Debenture Stock.
By order,
FRANK BUSH,
Secretary.
Offices: 709a, Old Kent Road, S.E.,
Aug. 18, 1897.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Power.
He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.
Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.
Offices: 18, FINSBURY CIRCUS, E.C.

Now Ready, Price 10s. 6d.

WARNER'S DIAGRAMS
OF THE ANNUAL
AVERAGES OF PARLIAMENTARY RETURNS RELATING TO GAS UNDERTAKINGS,
1887 TO 1895.
Together with the Private and Public Undertakings Grouped—1895 and 1896 Workings.
COMPILED BY
W. J. WARNER, of South Shields.

These Diagrams, which were noticed in the "JOURNAL" for Aug. 24, 1897, may be had of
WALTER KING, 11, Bolt Court, FLEET ST., E.C.

E. ASQUITH & CO.,
Hydraulic Engineers,
17, Mather Street, Ancoats, Manchester,
Fit up Plants for
Pressing Anthracene, Naphthalene, &c.
Competent Men sent out to erect same. Estimates given.

COKE-BREAKERS,
PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT)
New Design, with two Cutting Rollers, making less Breeze than their old pattern.
GEORGE WALLER & CO.,
165, QUEEN VICTORIA STREET, E.C.,
And at STROUD, GLOUCESTERSHIRE.

Telephone: Castleford No. 214. | Postal Address: Castleford.
Telegrams: "Silkstone Castleford."
THE SILKSTONE & HAIGH MOOR COLLIERIES, LTD.
ALLERTON BYWATER, CASTLEFORD.
Steam, Manufacturing, & Gas Coals & Cannel
Analysis, Contracts, Trial Waggons, and Quotations for Large and Small Orders. Inquiries Solicited.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

HOLMSIDE GAS COALS.
PRESENT DAILY PRODUCE OVER 4000 TONS.
LATEST ANALYSIS—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.
Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.
HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.
PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.
RESULTS OF DIFFERENT ANALYSES:—
Yield of Gas Per Ton . . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar. . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.
The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal*; and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*
These Coals may be bought through the Principal Merchants in England, or direct from
MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

BOLDON GAS COALS.
ANALYSIS.

Yield of Gas per ton .	10,500	Cubic Feet.
Illuminating Power .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

For Prices, &c., apply to
W. H. PARKINSON,
THE HARTON COAL CO., LTD.,
NEWCASTLE-ON-TYNE.
Telegraphic Address: "PARKINSON NEWCASTLE."

THORNLEY GAS COALS
WORKED BY THE
WEARDALE IRON & COAL Co., Ld.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.
Analysis made by
Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . .	16·9 Candles.
Coke (of good quality) .	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

Lanemark Coal Co.,
LIMITED.
LANEMARK CANNEL AND GAS COALS.
Quotations and Analysis on Application to
LANEMARK COLLIERY,
NEW CUMNOCK, N.B.
Shipping Ports: All the principal Scotch Ports.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.
For Particulars, Price, &c., apply to Mr. EDWARD PRICE, 119, Queen's Road, FINSBURY PARK, N.
Prices are Reduced.

ARMSTRONG'S PATENT
CANDLE SAFETY LAMPS.

No. 1. No. 2. No. 3.
43, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887,
for
CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21, JOHN STREET ADELPHI, LONDON, W.C.

JOHN BROWN & CO., LTD., SHEFFIELD.

Proprietors of

ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS, SHEFFIELD."

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, NEAR SHEFFIELD.

Established 1858. The First Manufactory of Silica and Dinas Fire-Bricks erected in England.

MANUFACTURERS OF

SILICA FIRE-BRICKS

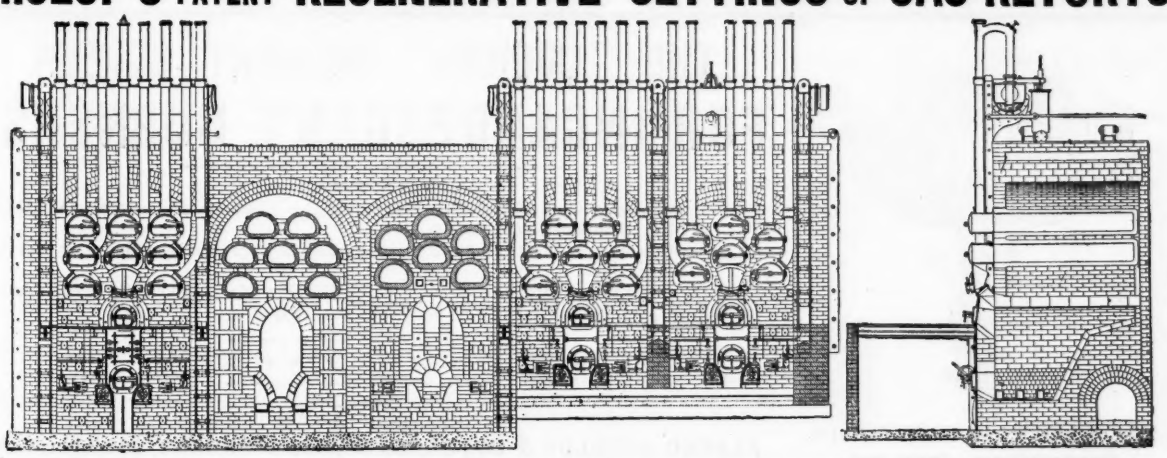
(TRADE MARK "SILICA")

Specially adapted for Siemens-Martin Gas-Furnaces; also for Gas, Copper, Iron, Steel, and other Furnaces where intense heat is required.

BESSEMER GANNISTER, STEEL-FURNACE GANNISTER, COPPER-FURNACE GANNISTER, IRONFOUNDERS' CUPOLA SAND, FINE-SETTING SILICA CEMENT, STEEL MOULDERS' COMPOSITION.

Our Silica Bricks have gained a high reputation for Unsurpassed Quality in most of the leading Firms in England and on the Continent. Export orders delivered Liverpool, Hull, Grimsby, or the Tyne.

HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY, AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS CARBONIZING FROM 17 TO 20 CWT. OF ENGLISH AND 20 TO 24 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13,000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS; AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

Drawings and Tenders are furnished for the complete erection of Benches, including Retort and Bench Mounting of the most modern and approved description; or existing Ovens fitted up with the Patentee's arrangements.

Agents: **Messrs. JONAS DRAKE AND SON**, Retort Setters and General Carbonizing Engineers, Ovenden, Halifax, Yorkshire, Sole Agents for England, Wales, and Foreign Countries; **C. M. HAMILTON**, Retort Setter and Contractor, Hamilton, Agent for Scotland and Ireland; Principal Agent, **R. F. HISLOP** (Son of Patentee), General Constructing and Carbonizing Engineer, Gas-Works, Paisley, N.B., and to whom all Inquiries should be addressed in the first instance.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine quâ non*

TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.

The Patentee's SELF-SEALING CAPS FOR THE TOP OF ASCENSION-PIPES, and his "SPECIAL" FLUE PORT BOXES, are most important additions to his Carbonizing Plant.

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under G. R. HISLOP'S Patents, all Spent Limes are effectively recovered at from one-third to one-half the cost of New Lime.

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TROTTER, HAINES, & CORBETT,
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Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
Shipments Promptly and Carefully Executed.

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HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas. Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

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CHESTERFIELD.

WATERBLEAN PAINT

Telegrams:
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HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

LONDONDERRY GAS COALS
FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

For Prices and Particulars, apply to
S. J. DITCHFIELD,
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HARRIS & PEARSON,
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MANUFACTURERS OF
FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.
GLAZED BRICKS AND PORCELAIN BATHS.

Wrought-Iron

And Fittings and Accessories.

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MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM.
BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c., AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., Ltd., Short St., LAMBETH.

THE "COOMBE" DRAUGHT SCREEN.
Protection granted, 1896, No. 2075.

THE "COOMBE" DRAUGHT SCREEN FOR INCANDESCENT BURNERS.

ADVANTAGES.
1.—Prevents draughts of cold air from ascending the Chimney, and thereby lengthens the life of Chimney and Mantle.
2.—Prevents attempts to light spills, &c., in Bars and Restaurants, by which many Mantles are destroyed.
3.—Presents an ornamental appearance, which greatly adds to the beauty of the Burner.
4.—Prevents "Lighting-Back," and keeps out dust and dirt.

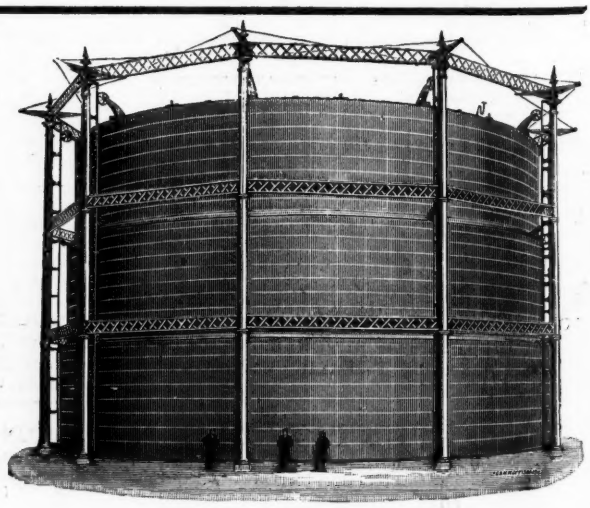
SOLD EVERYWHERE.

Wholesale of the Patentees,
ALFRED ARCULUS & CO., GLASS MANUFACTURERS, BIRMINGHAM.
"An Incandescent Burner without a Draught Screen is like a Man without a Collar."

HANNA, DONALD, & WILSON,
(Established 1851),
GAS ENGINEERS & CONTRACTORS,
Abercorn Foundry and Abbey Works,
PAISLEY, N.B.,
MAKERS OF
Gasholders and Gas Plant
OF EVERY DESCRIPTION.

Sole Agents for Scotland for the Automatic Coal-Gas Retort (Inclined System) Company, Limited.

Telegraphic Address: "Donald, Paisley."



H. KIRKHAM & CO.

Are now prepared to Tender for **SCRUBBER-WASHERS** fitted with their Patent Basket or Cage, with Improved Washing Surface. It is acknowledged to be the **MOST EFFECTIVE MACHINE** for extracting Ammonia and other Impurities from Coal Gas. It is guaranteed to Purify 20 per cent. more Gas in the same space, and at considerably less cost per Machine. The Baskets and Scrubbing Surface can be readily applied to all the sizes of the Kirkham, Hulett, and Chandler Machines now in use.

Office: 335, MANSION HOUSE CHAMBERS, LONDON, E.C.

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TELEPHONE No 43.
"HALIFAX EXCHANGE"

GAS ENGINEERS. CONTRACTORS. IRONFOUNDERS.

RETORT SETTERS. FURNACE BUILDERS. ETC. ETC.

JONAS DRAKE & SON

SOLE AGENTS FOR
HISLOP'S
PATENT REGENERATIVE FURNACES
— FOR —
ENGLAND, WALES & ABROAD.
RETORT BENCHES ERECTED COMPLETE WITH OR WITHOUT SPECIAL FURNACES.
RESULTS GUARANTEED.

OVENDEN HALIFAX

Designs and Estimates on Application.

GASEOUS FIRING A SPECIALTY.

GOODSON'S

Patent Self-Acting

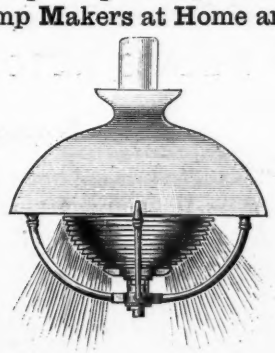
GAS GOVERNORS AND BURNERS.

Approved of by the principal Corporations, Gas Companies, and Lamp Makers at Home and Abroad.

THE STREET-LAMP GOVERNOR.

12s. per Dozen.

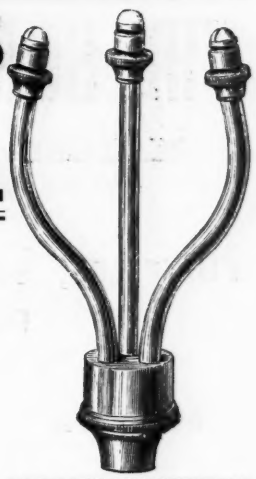
THE "GLOSTER."



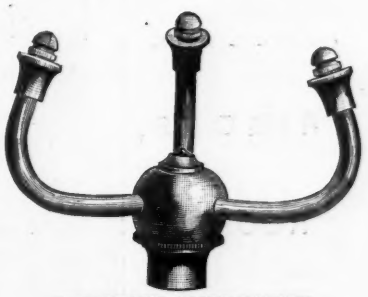
ARGAND BURNER,
With Patent Light-Diffusing Hemispherical Glass, giving an increase of Light of from 300 to 400 per cent.

Consumption of Gas per Hour.
No. 1, 4½ ft. No. 2, 5½ ft. No. 3, 6½ ft.

OTHER DESIGNS AND PRICE LIST, WITH TRADE TERMS, ON APPLICATION.



THE LONG COMBINATION.



THE SHORT COMBINATION.

GOODSON & CO., 213, Vauxhall Bridge Road, LONDON, S.W.

MILNE'S PATENT
PREPAYMENT DRY METER.

MOST compact Attachment in the Market.
Same Height as an Ordinary Meter.

Cast-Iron Attachment Cover, with extra large Money-Box, which is withdrawn while opening Door.

Absolutely Positive in Action.

The Whole Mechanism always in Gear.

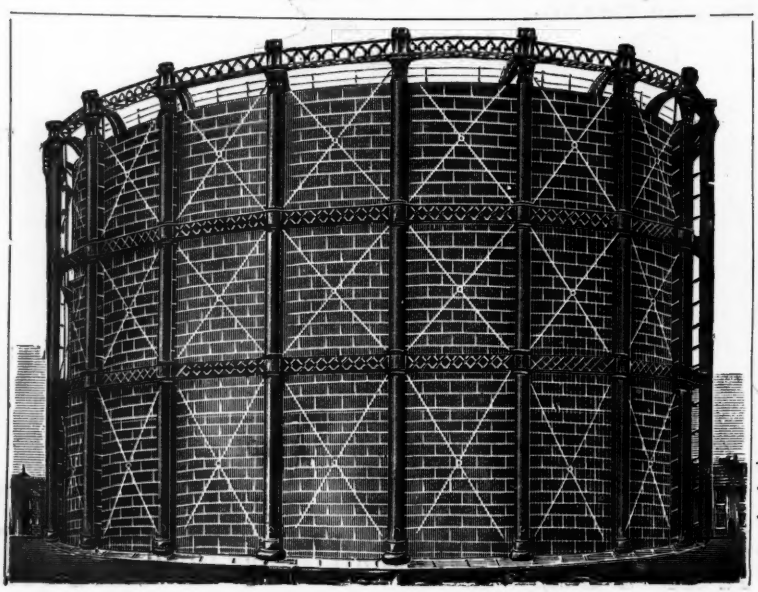
The following unsolicited comparison has been sent us as showing the exact correspondence of amount due per Index and Cash in Money-Box with these Meters as against those of other Makers :—

Milne's	Meter due per	Index	3/4	Cash in Box	3/4
Milne's	,,	,,	4/2	,,	4/2
Milne's	,,	,,	2/6	,,	2/6
Milne's	,,	,,	3/4	,,	3/4
Milne's	,,	,,	2/6	,,	2/6
Two other Makers.	,,	,,	6/8	,,	6/11
	,,	,,	1/8	,,	2/0
	,,	,,	3/9	,,	5/2
	,,	,,	2/6	,,	2/8
	,,	,,	4/7	,,	6/0

JAMES MILNE & SON, LTD.,
MILTON HOUSE WORKS,
EDINBURGH.
LONDON. GLASGOW. LEEDS.

THE HORSELEY CO., LTD., TIPTON, STAFFORDSHIRE.
MAKERS OF
GASHOLDERS & GAS PLANT,
PURIFIERS, SCRUBBERS, CONDENSERS, WASHERS, TANKS, VALVES, PIPES, LAMP PILLARS, RETORT-FITTINGS, ETC.

ALSO ALL KINDS OF
STRUCTURAL IRON
AND STEEL WORK.
BRIDGES,
ROOFS,
PIERS, ETC.



WORKS AND HEAD OFFICE
TIPTON,
STAFFORDSHIRE.

LONDON OFFICE:
11, VICTORIA ST,
WESTMINSTER.

TELEGRAPHIC ADDRESSES:
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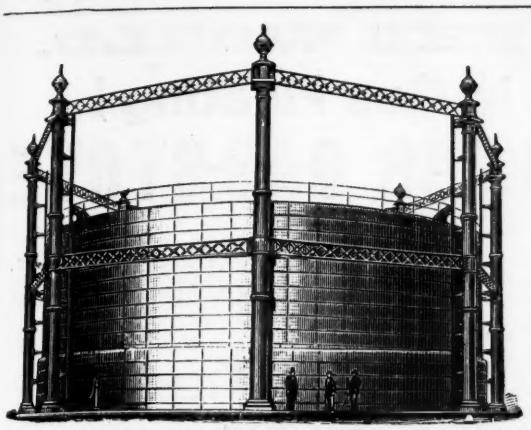

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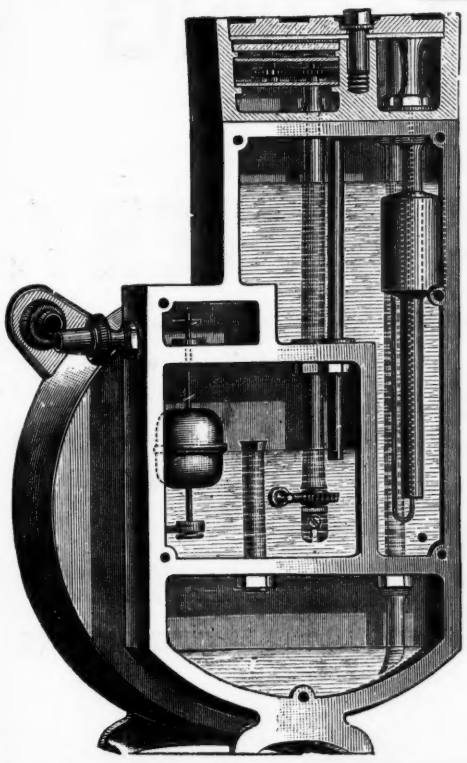

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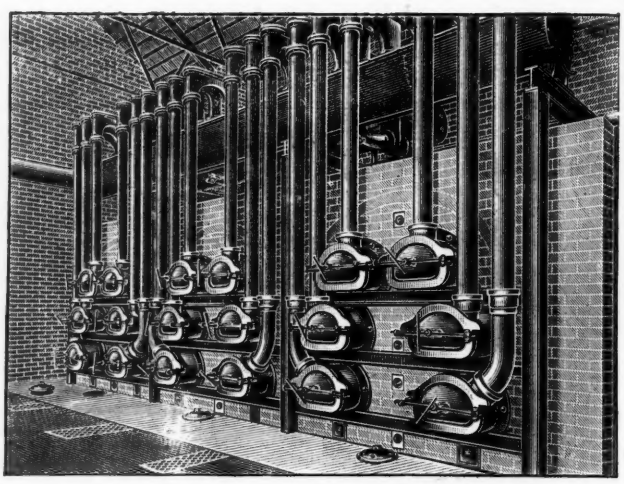

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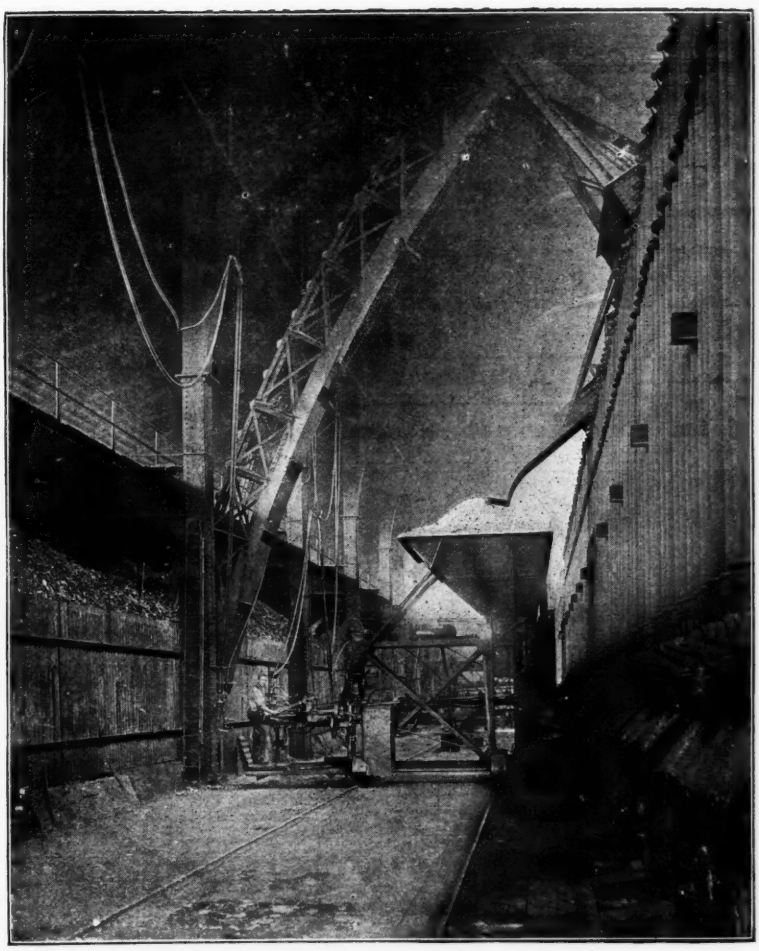

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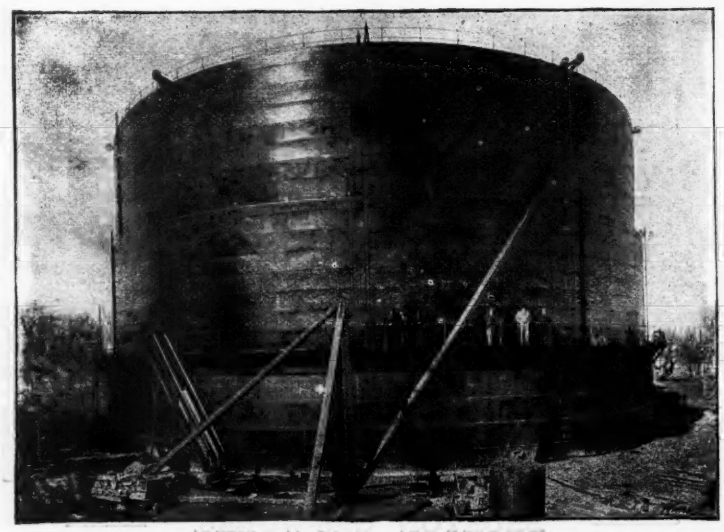

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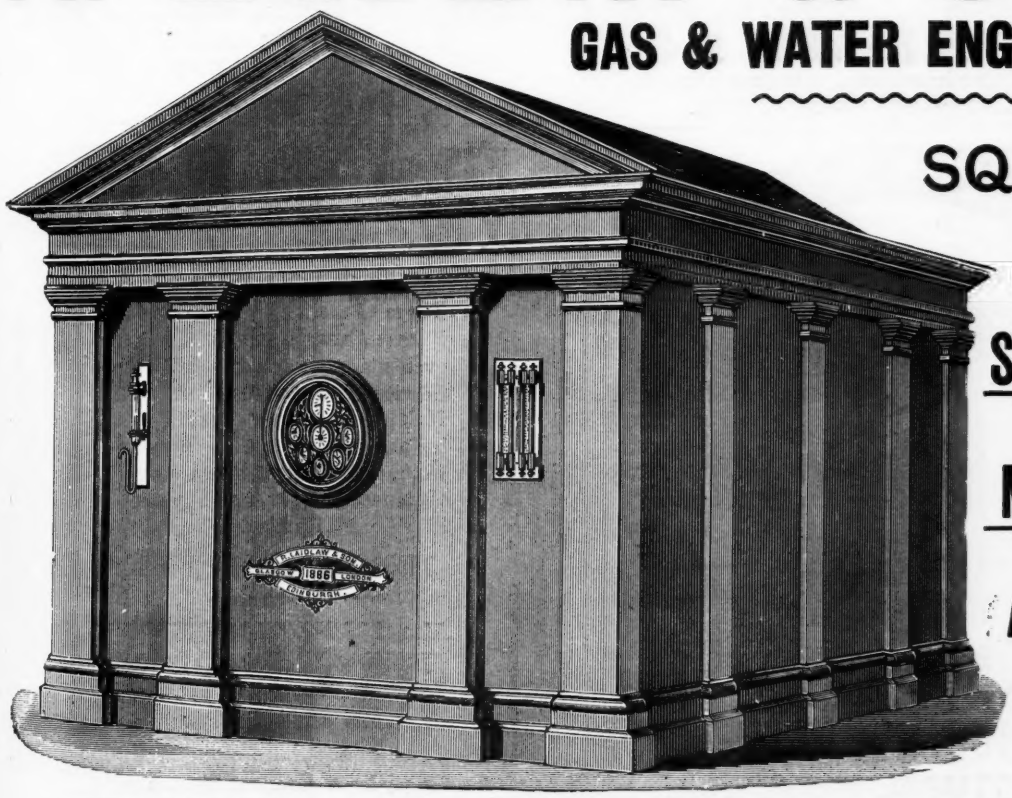

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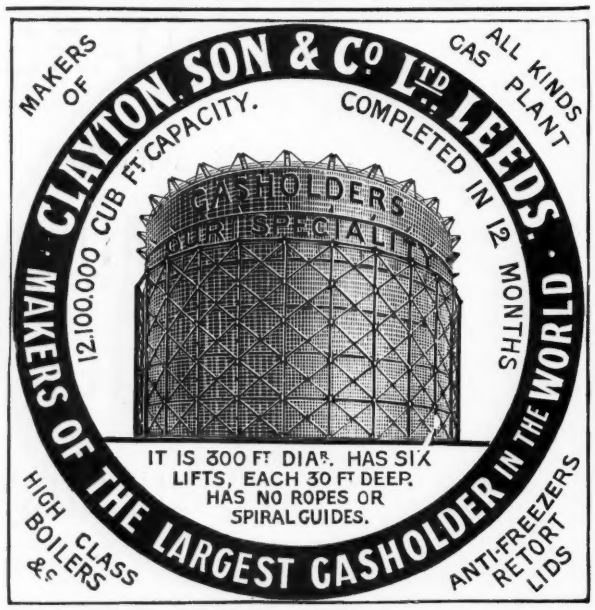
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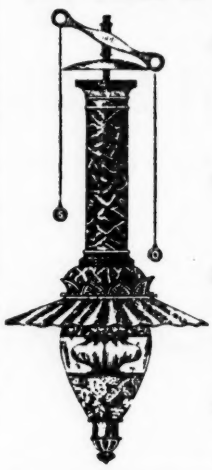

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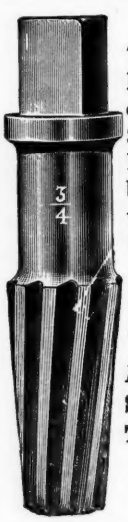

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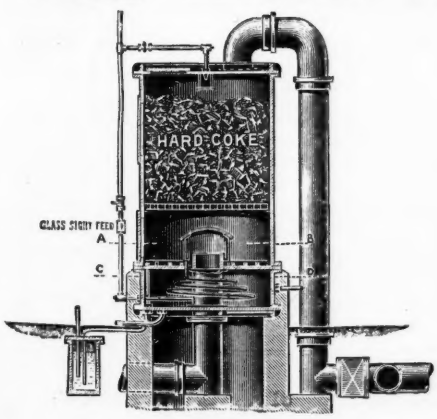

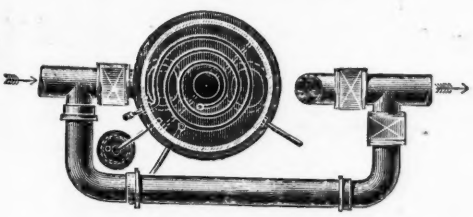

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[See also Advt., p. 520.

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